



GRUMMAN FF-1

Originally conceived in mid-1930, the first winged product of the (then) Grumman Aircraft Engineering Corporation took to the air on Dec. 29, 1931, and was delivered later that same day to the Anacostia Naval Test Center. The XFF-1 proved to be good. So good that 27 were ordered, powered with the Wright R-1820-78 of 700 hp. With this powerplant, and the novel for its day-retractable landing gear and covered cockpits, production FF-1s could exceed 200 mph at a time when the standard single seat F4B-4 could reach but 188 mph.

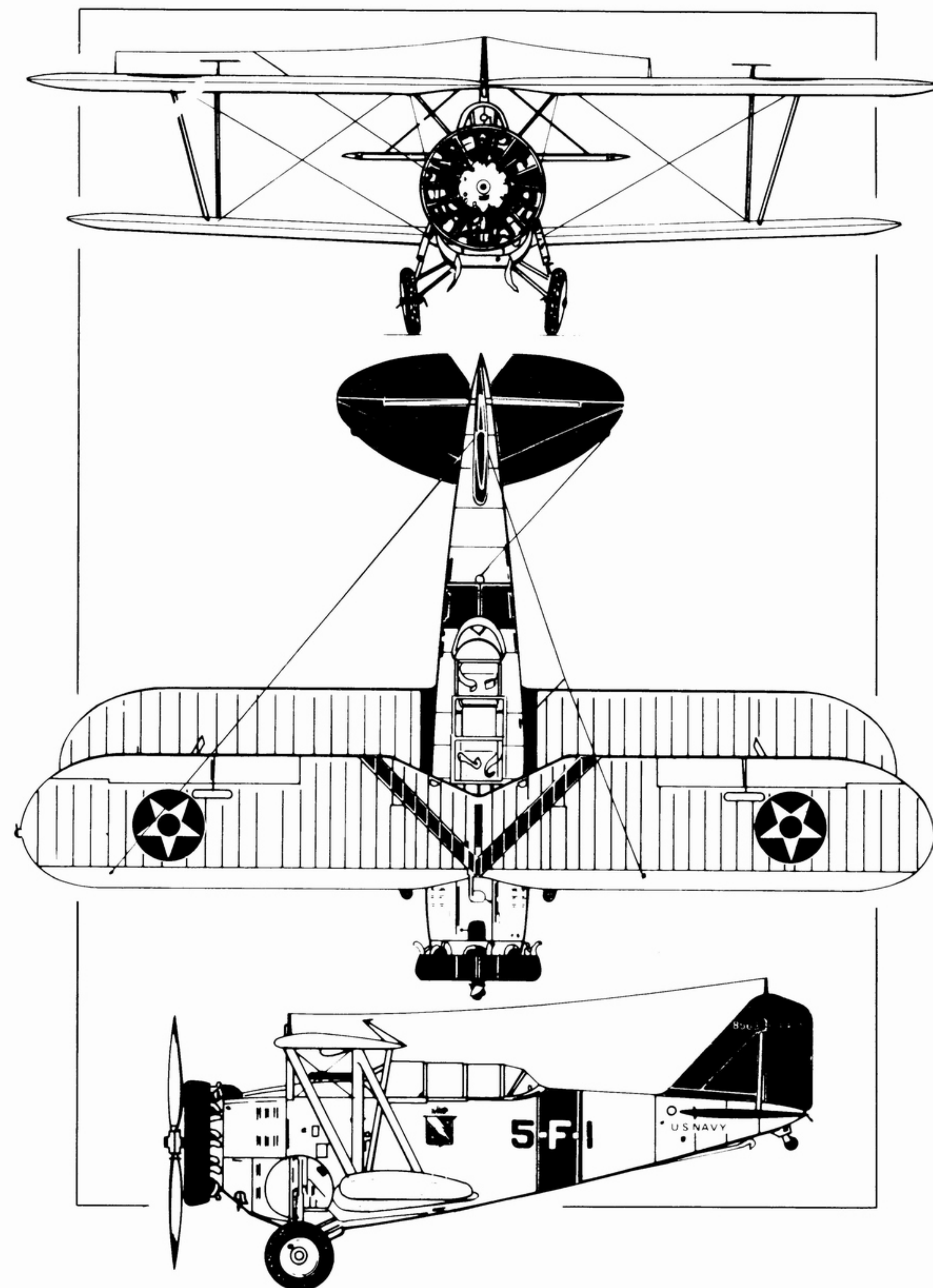
Thirty-four essentially similar SF-1 scouts were ordered for the U. S. Navy for delivery during 1934.

A license to manufacture the FF-1 (as the GE-23) was granted Canadian Car & Foundry Company of Montreal, and 40 airplanes were sold to the Spanish Republican Government during 1938. Eight of these survived the Civil War, to serve the Spanish Air Force, as the *Delfin*, until about 1956. A further 15 *Goblin's* were sold to the Royal Canadian Air Force during late 1940. At one time these *Goblin's* constituted the sole fighter force on the Canadian East coast.

In 1968 an exported CCF *Goblin* was discovered in Nicaragua, flown to the U.S.A. and purchased by Grumman. Following a complete overhaul, the famous first was painted in authentic colors and may now be seen in the U. S. Navy's Pensacola Air Museum.

FF-1 SPECIFICATION

Crew	2 (pilot and observer/gunner)
Powerplant	700/750 hp Wright R-1820-78
Span	34 ft 6 in.
Length	24 ft 6 in.
Speed	207 mph at 5300 ft
Range	647 st mi
Service ceiling	22,000 ft
Weight	3221/4800 lb
Armament	3 30-cal machine guns



Grumman Aerospace Corporation
Bethpage, New York 11714



GRUMMAN F3F-3

On Oct. 15, 1934, Grumman was awarded a contract for the design and construction of the prototype XF3F-1. This aircraft was to use the same Pratt & Whitney R-1535 engine as the previous F2F-1, but be aerodynamically refined. Fifty-four production F3F-1s were ordered in Aug. 1935, proving to be more maneuverable and possessing better directional stability than the F2F-1. The F3F-1 could take off within 200 ft and, despite higher weight and larger dimensions, proved equally as fast as the earlier single-seater.

In 1936, the 1000 hp Wright Cyclone was proposed to be used in a further improved design, the prototype of which, the XF3F-2, was delivered to the Navy on July 27, 1936. Improved performance included an increase in maximum speed to 255 mph (the F2F-1 and F3F-1 were capable of 229 mph at 9400 ft) and a service ceiling increased by 4000 ft (versus the previous 29,800 ft). As a result, Grumman received a March 1937 U. S. Navy contract for 81 production F3F-2s.

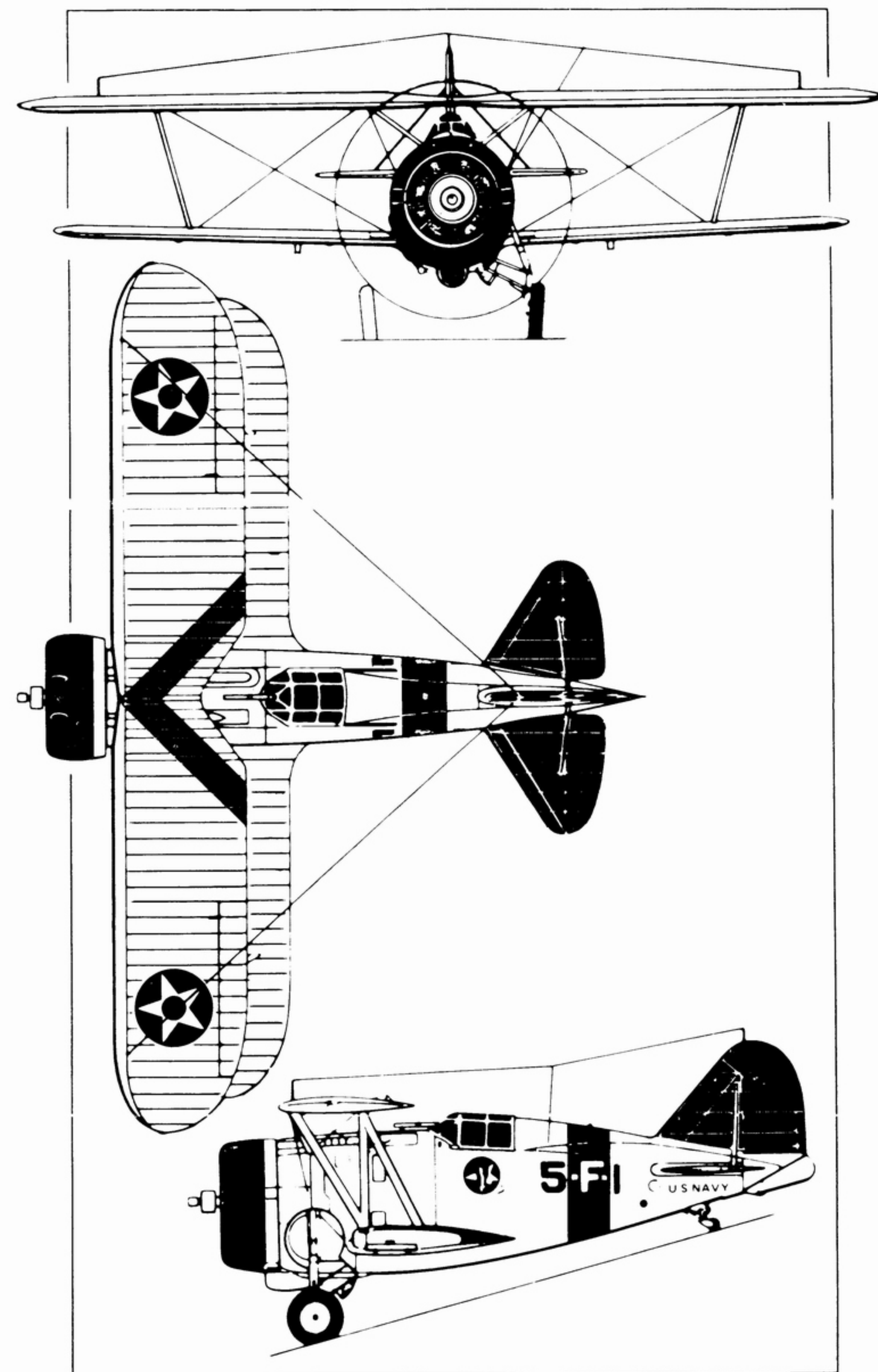
In 1938, because of difficulties arising from slow development of the Navy's first monoplane fighters, a further improved modification of the famed "flying barrel" was ordered as the F3F-3. These aircraft were considered to be a delight to fly. The F3F-3 was an extremely strong aircraft, faster and more maneuverable than its predecessors, handled superbly, snap rolled with exacting precision, and could three-point with any power setting or loading condition. Its pilots considered it the ultimate biplane shipboard fighter. By mid-1939, all first-line U. S. Navy and Marine Corps squadrons flew Grumman fighters, exclusively.

As the last days of peace for the United States drew near, there were still 140 Grumman F2F and F3F fighters serving the U. S. Navy as fighter pilot trainers at the large air stations at Norfolk, Miami and Corpus Christi. The last Grumman biplane fighter was to remain in service until late in November 1943.

F3F-3 SPECIFICATION

Crew	1 (pilot)
Engine	950 hp Wright R-1820-22
Span	32 ft
Length	23 ft
Weight	3254/4403 lb
Internal fuel	130 gal
Range	1150 st mi
Speed	264 mph at 15,200 ft
Armament	1 30-cal and 1 50-cal machine guns

Note: Photograph shows civil G-32A, c/n 447, manufactured June 1938. Aircraft was last owned by Windward Aviation, Enid, Oklahoma.



Grumman Aerospace Corporation
Bethpage, New York 11714



J2F DUCK

The forerunner of 645 examples, the prototype XJF-1 first took to the air on April 24, 1933, powered by a Pratt & Whitney R-1535-62 of 700 hp. Through the ensuing 12 years of production, various models used R-1820 and R-1830 engines of up to 1050 hp.

On December 20, 1934, JF-2 No. 0266, powered by an R-1820 Wright Cyclone and piloted by Lt Cmdr E.F. Stone of the U.S. Coast Guard, set a new unofficial world's speed record for its class of 191.796 mph.

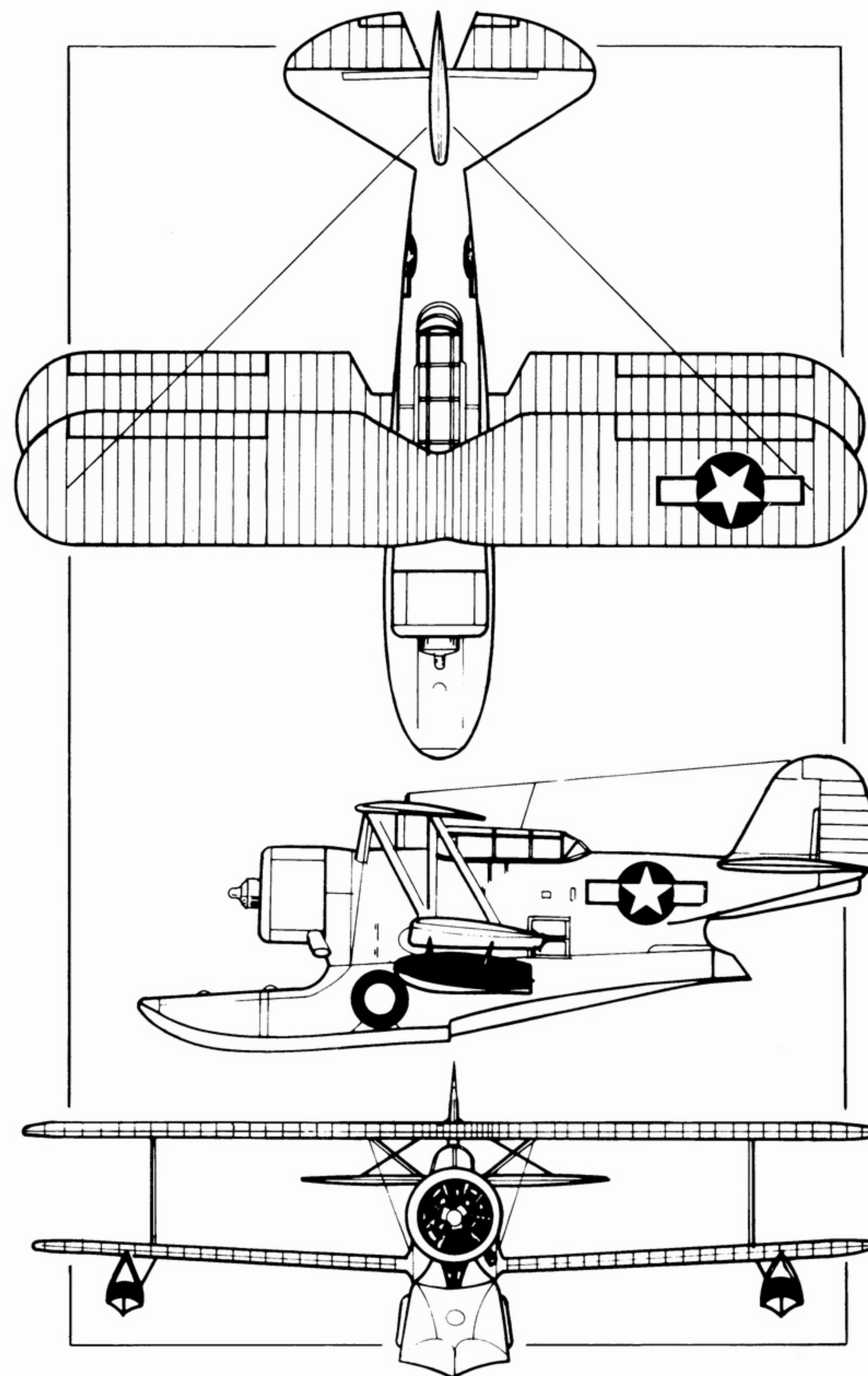
Production for the U.S. services continued until 1946; to free Grumman's facilities for production of vitally needed *Hellcats*, Columbia Aircraft of Valley Stream, Long Island, was established to license-build 330 *Ducks*. The Argentine Navy purchased 12 *Ducks* in 1937 and 1939. Following World War II, a number of surplus *Ducks* was transferred to Columbia. *Ducks* were used for personnel transport, scouting, patrol and rescue, photo, target towing, mail, cargo, and any and all odd jobs that arose in the services.

The "Candy Clipper," a J2F-5 *Duck* raised from the water at the Cavite Naval Yard in the Philippines was used as a supply plane for the Bataan garrison following the outbreak of World War II. On April 8, 1942 she escaped from Cabcaben Airfield with six men aboard, one of whom was Carlos Romulo, later to become President of The Philippines.

An impressive indication of the strength of Grumman's "Iron Works" progeny was the superb performance of a *Duck* in the 1974 movie "Murphy's War." Incredibly rough water in the Orinoco River pounding the aircraft during takeoffs and landings and flight through trees showed that the structural integrity of this 30-year-old aircraft had not been diminished. The photograph depicts that airplane following repainting to represent a *Duck* as it looked during the colorful era of the 1930's.

J2F-5 SPECIFICATION

Span	39 ft	Service ceiling . . .	20,000 ft
Length	34 ft	Range	780 st mi
Height	12 ft 3½ in.	Armament	One 30-cal, two 100-lb bombs/two 325-lb depth charges
Wing area	409 sq ft	Crew	Pilot, observer/gunner, radio operator
Weight empty . . .	4941 lb	Powerplant	950 hp Wright R-1820-50
Weight loaded . . .	6696 lb		
Max. speed	170 mph		
Cruise speed	150 mph		



GRUMMAN AEROSPACE CORPORATION



GRUMMAN TBF AVENGER

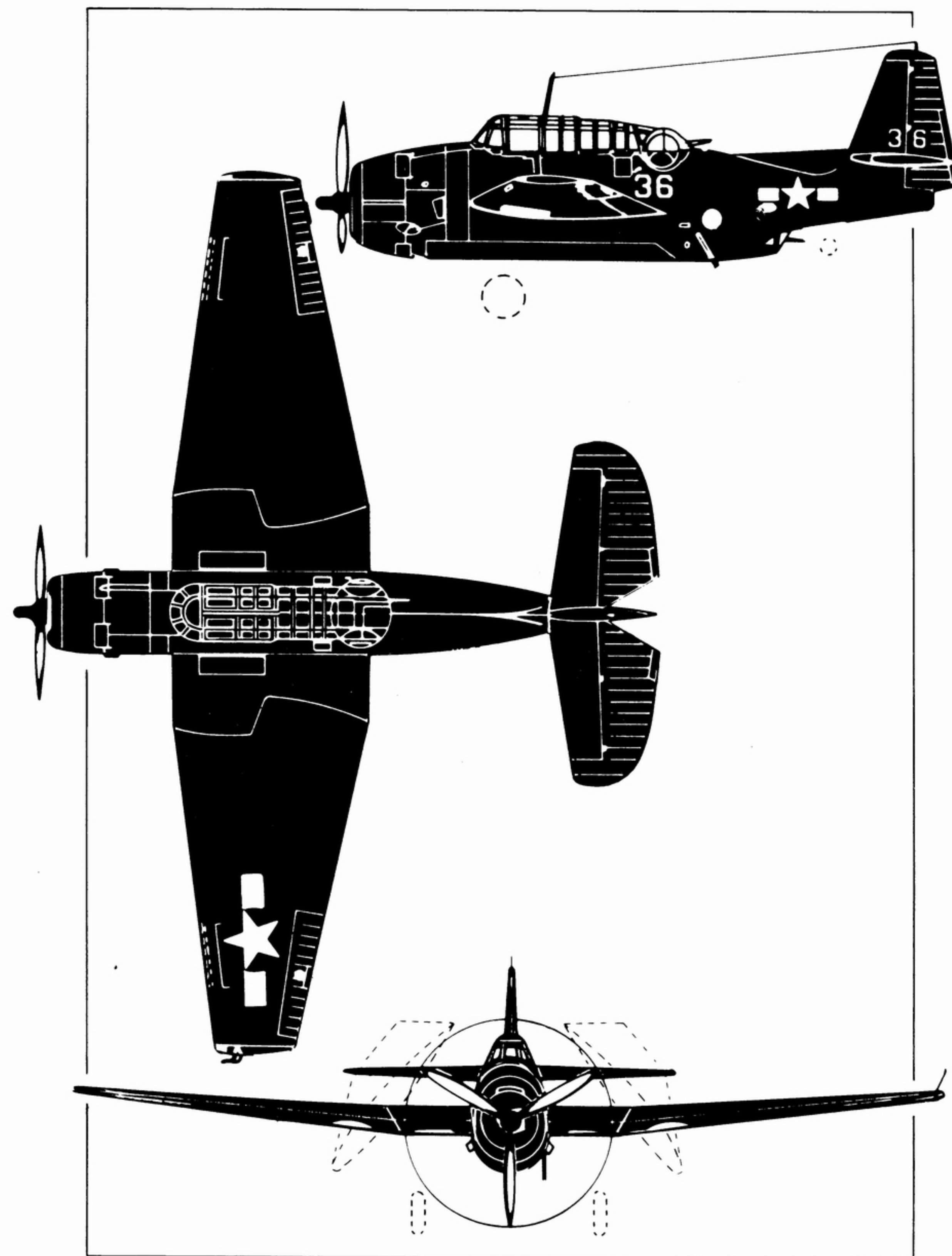
The famed TBF was contracted for by the U.S. Navy in 1940 as a replacement for the TBD-1 Devastator. First flight of the XTBF-1 was Aug. 7, 1941, while a production contract for 286 examples was placed in Dec. 1940. Dec. 7, 1941 was the date for the first public showing at a Grumman "Open House". Grumman delivered 145 production TBF-1s in the first half of 1942, six of this batch going to VT-8, flying from Midway Island on June 4, 1942 in the midst of the Battle of Midway.

Grumman production continued until 1944, totaling 2293. In the Spring of 1942, General Motors was contracted to manufacture the aircraft as the TBM, producing 2882 TBM-1s and a further 4664 as TBM-3s, to bring the grand total of Avengers to 9839. Although the majority of Avengers were TBF-1 and TBM-1 models, there were numerous variants and modifications: TBF-1B for the Royal Navy; TBF-1C; TBF-1D; TBF-1CP; TBF-1E; TBF-1L; TBM-3D; TBM-3E; TBF-3L; TBM-3P; TBM-3H. When the APS-20 radar was added, the designation was TBM-3W, which were paired with the TBM-3S to become the first hunter-killer types, remaining operational until mid-1954. Other postwar variants included the target-towing TBM-3U, the TBM-3N for night operations, the radar countermeasures TBM-3Q, and the seven-seat COD TBM-3R.

Avengers in their many variants served the Royal Navy, the Royal Canadian Navy, the Royal New Zealand Air Force, the Royal Netherlands Navy, the French Aeronavale and, as late as 1962, the Japanese Maritime Self Defense Force. An indication of the strength and longevity of the Grumman "Iron Works" products is the continuing use of Avengers as fire bombers into the 1970s.

TBF-1 AVENGER SPECIFICATION

Crew:	3 (pilot, gunner, radio operator)	Weight:	10,080/15,905 lb
		Speed:	271 mph at 12,000 ft
Powerplant:	1700 hp Wright R-2600-8	Service Ceiling:	22,400 ft
Span:	54 ft 2 in.	Range:	1215 st mi
Length:	40 ft	Armament:	2 30-cal + 1 50-cal 1600 lb bombs or torpedo



Grumman Aerospace Corporation



GRUMMAN TBF AVENGER

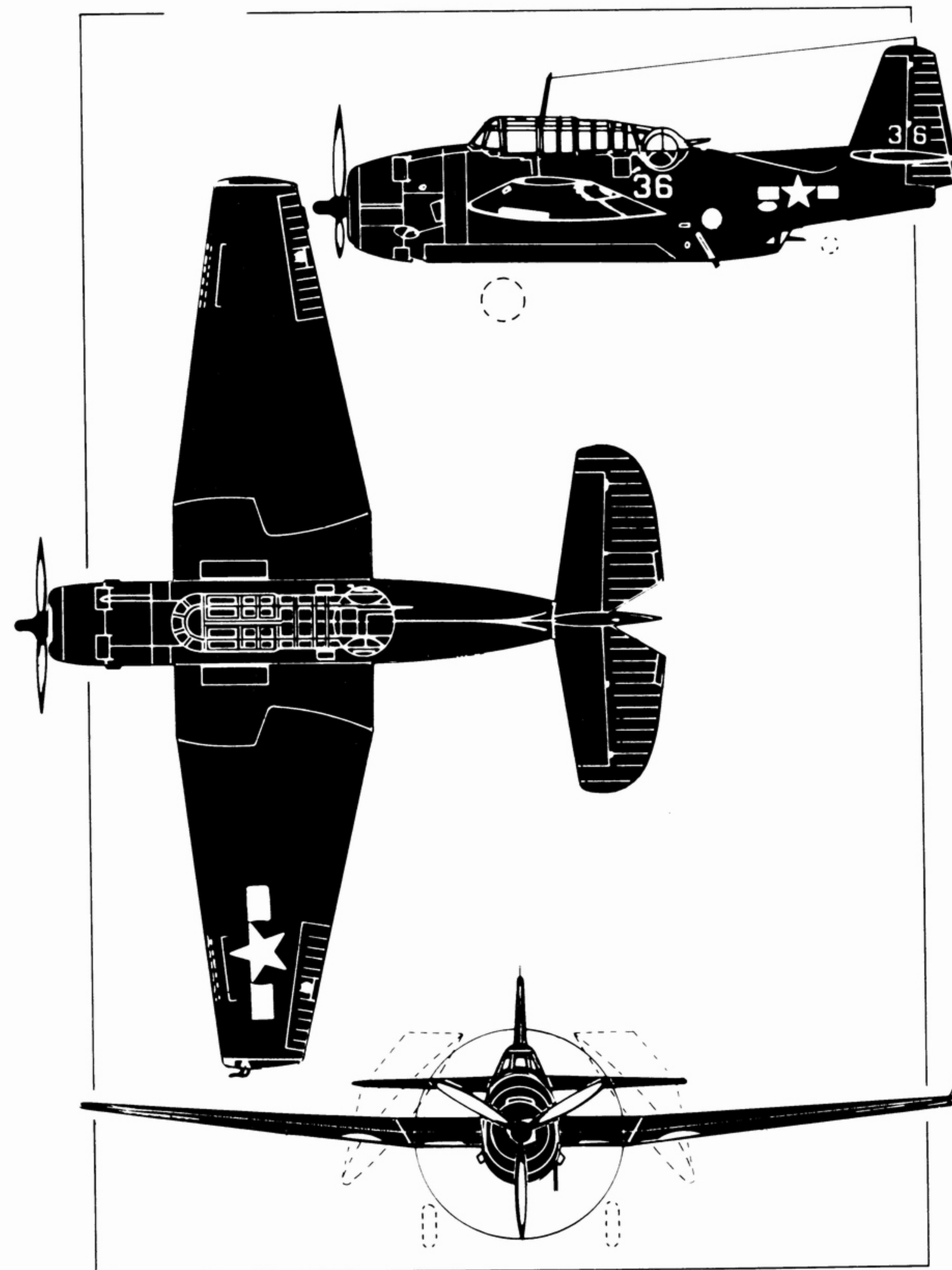
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Length:	40 ft	Range:	1215 st mi
		Armament:	2 30-cal + 1 50-cal 1600 lb bombs or torpedo



Grumman Aerospace Corporation



GRUMMAN F4F WILDCAT

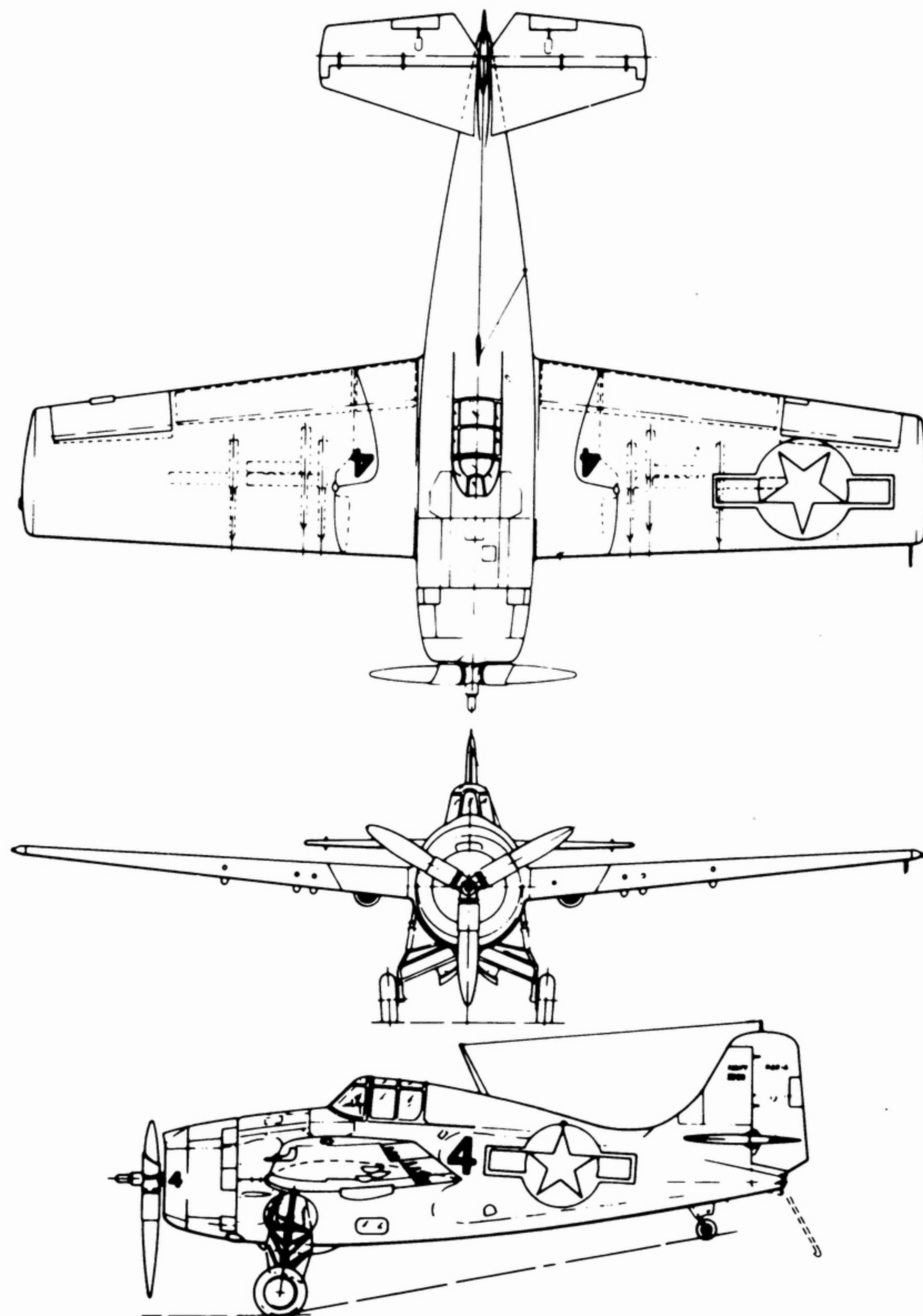
Grumman's first monoplane, and one of the U. S. Navy's outstanding World War II fighters, the XF4F-2 first flew from the Bethpage, Long Island flying field on Sept. 2, 1937. Production models of this famous aircraft, also built by General Motors (FM-1 and FM-2), were powered by either the Pratt & Whitney R-1830 or the Curtiss-Wright R-1820 engines rated at 1200 or 1350 hp at take-off. A total of 7898 Wildcats was built by both manufacturers.

The Wildcat was also ordered (as the Martlet) by the British Royal Navy; the first was delivered on July 27, 1940, prior to U. S. Navy F4F-3 deliveries. The first enemy aircraft to fall to the guns of the F4F was a *Luftwaffe* Ju.88 attacking the Royal Navy base in the Orkney Islands on Christmas Day, 1940. This Ju.88 was the first enemy aircraft to be shot down by an American-built fighter in service with British forces. The first U. S. Navy combat use of the F4F was with VMF-211 at Wake Island, following the Pearl Harbor attack. The F4F was soon in service throughout the Pacific, notably at the battles of the Coral Sea, Midway and Guadalcanal. The Wildcat also participated in the Nov. 1942 North African campaign, flying from the U. S. S. *Ranger*.

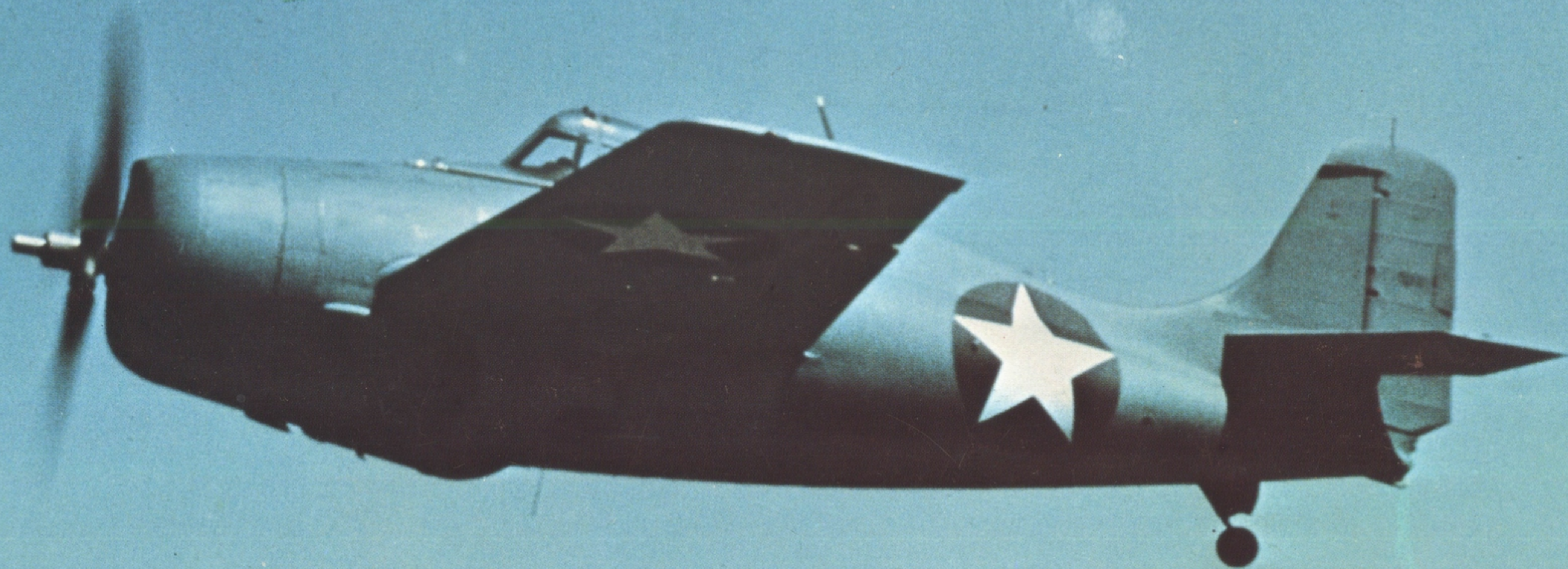
As a contemporary design to the famed Japanese Zero-Sen, the F4F was inferior in several respects, but was able to hold its own due to superior armament, rugged construction, a superb engine, and extremely well-trained pilots. The official U. S. Navy figures for the ratio of victories to losses in air combat show that the Wildcat was the victor almost seven times more often than it was the loser; this indicates that this product of the Grumman "Iron Works" more than held its own against its opposition.

F4F-4 SPECIFICATIONS

Crew	1 (pilot)
Powerplant	1200 hp P&W R-1830-86
Span	38 ft
Length	28 ft 9 in.
Weight	5766/7964 lb
Speed	318 mph at 19,400 ft
Range	770 st mi
Service ceiling	34,900 ft
Armament	Six 50-cal machine guns



Grumman Corporation



GRUMMAN F4F WILDCAT

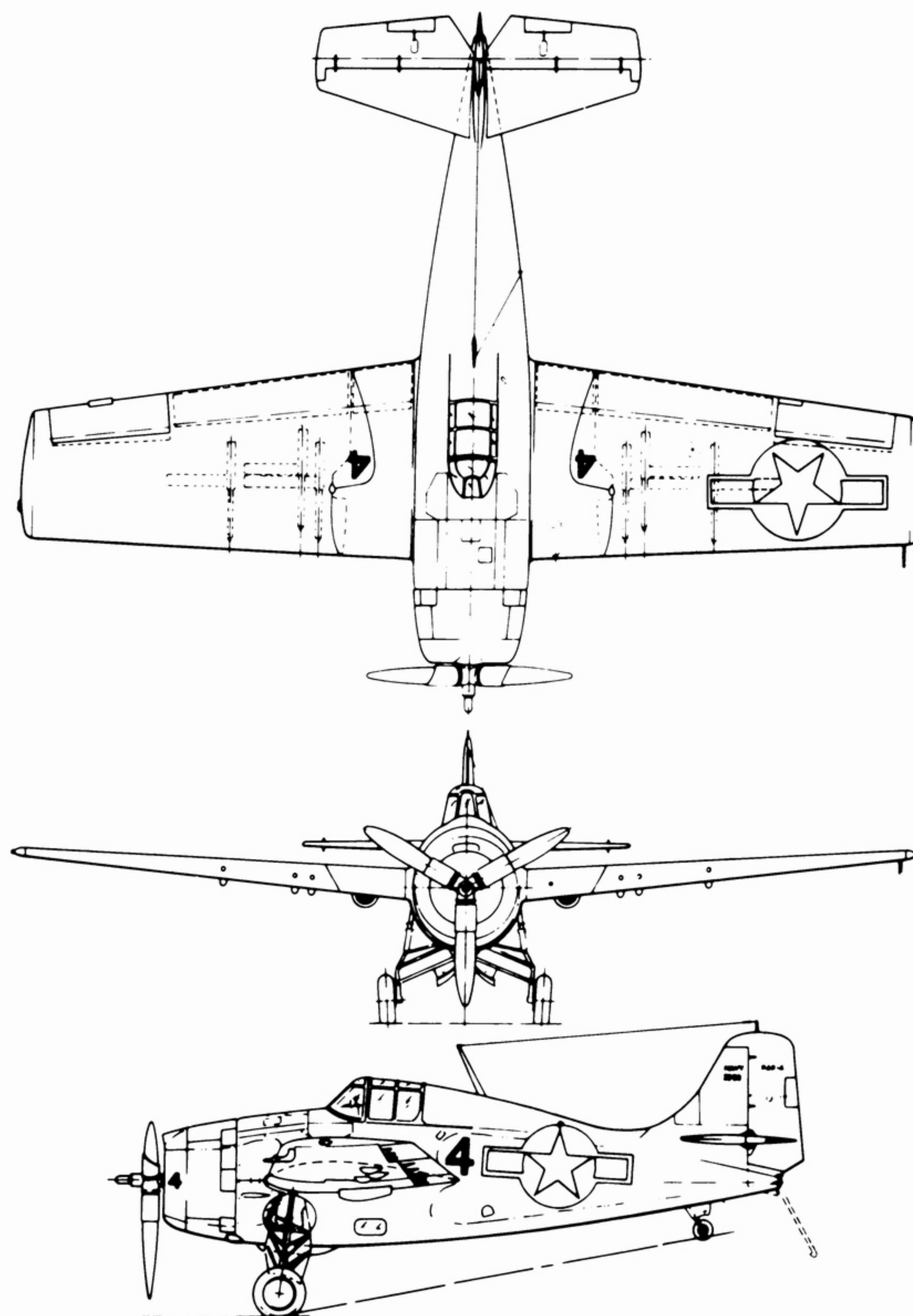
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GRUMMAN AEROSPACE CORPORATION



GRUMMAN F7F-2N TIGERCAT

Grumman's F7F *Tigercat* incorporated the search and attack characteristics the U.S. Navy wanted for Pacific operations during WWII. With radar housed in its long nose, this multi-purpose fighter was fast, stable, maneuverable, and capable of sustained missions. Designed to operate from the forthcoming 45,000-ton carriers of the USS *Midway* class, the *Tigercat* was destined to be the Navy's first twin-engined fighter built in production quantities and the first carrier based fighter to use a tricycle landing gear.

Piloted by Bob Hall, the first of two XF7F-1s flew on December 2, 1943. The pressing needs of U.S. Marine Corps squadrons engaged in supporting land fighting in the Pacific led to a substantial order for the new fighters.

Although classified as a fighter, the aircraft was heavily armed to function in a tactical support role. Four 20-mm cannons in the wing root carried 200 rounds apiece and four .50-caliber guns in the nose carried 300 rounds per gun. Three bomb racks, one located on each wing and one underneath the fuselage, allowed the aircraft to carry a mix of bombs, torpedoes, and rockets. Powered by two 2,100 horsepower Pratt & Whitney R-2800-22 engines slung in large nacelles beneath the wings, the single-seat F7F-1 model had a maximum speed of 450 mph and a rate of climb of 5,300 feet per minute.

Six versions of the F7F *Tigercat* were produced. After 34 F7F-1s had been delivered, production switched to a two-seat nightfighting version, the F7F-2N pictured on the front of this card. Re-engined with R-2800-34W engines, the single-seat F7F-3 had the largest production run. Subsequent two-seaters, the F7F-3N and -4N nightfighters, were modified to accommodate more sophisticated radar.

The *Tigercat* was too late for operational service in WWII. The first squadron of Marines equipped with F7Fs arrived on Okinawa the day before VJ day. The aircraft served with a few Marine squadrons after the war but was soon displaced by jet-powered fighters and fighter bombers. It did see some action in the Korean conflict, and several of these sturdy aircraft served as water bombers for fighting forest fires until the early 1970s.

F7F-2N SPECIFICATIONS

DIMENSIONS

Wing span	51 ft 6 in.
Length	45 ft 6½ in.
Height	13 ft 9 in.

WEIGHT

Empty	16,028 lb
TOGW	21,690 lb

PERFORMANCE

Max. speed	512 kt
Cruise speed	219 kt
Service ceiling	40,600 ft
Range	2,060 n mi

ARMAMENT

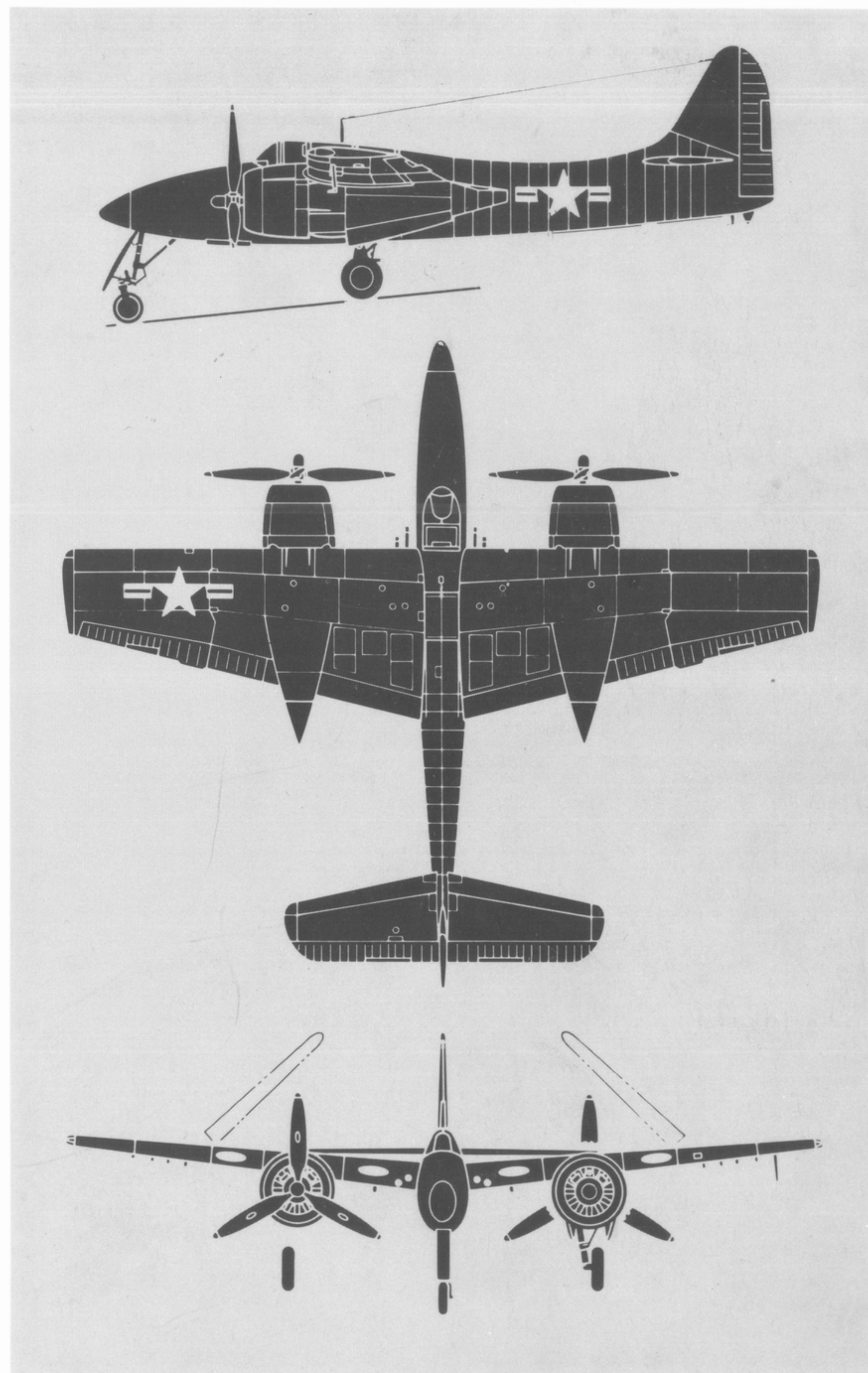
- (4) .50-caliber machine guns
- (4) 20-mm cannons
- (2) 1,000-lb bombs or
(1) 2,150-lb torpedo
- (8) 5-in. HVAR rockets or
(2) Tiny Tim rockets

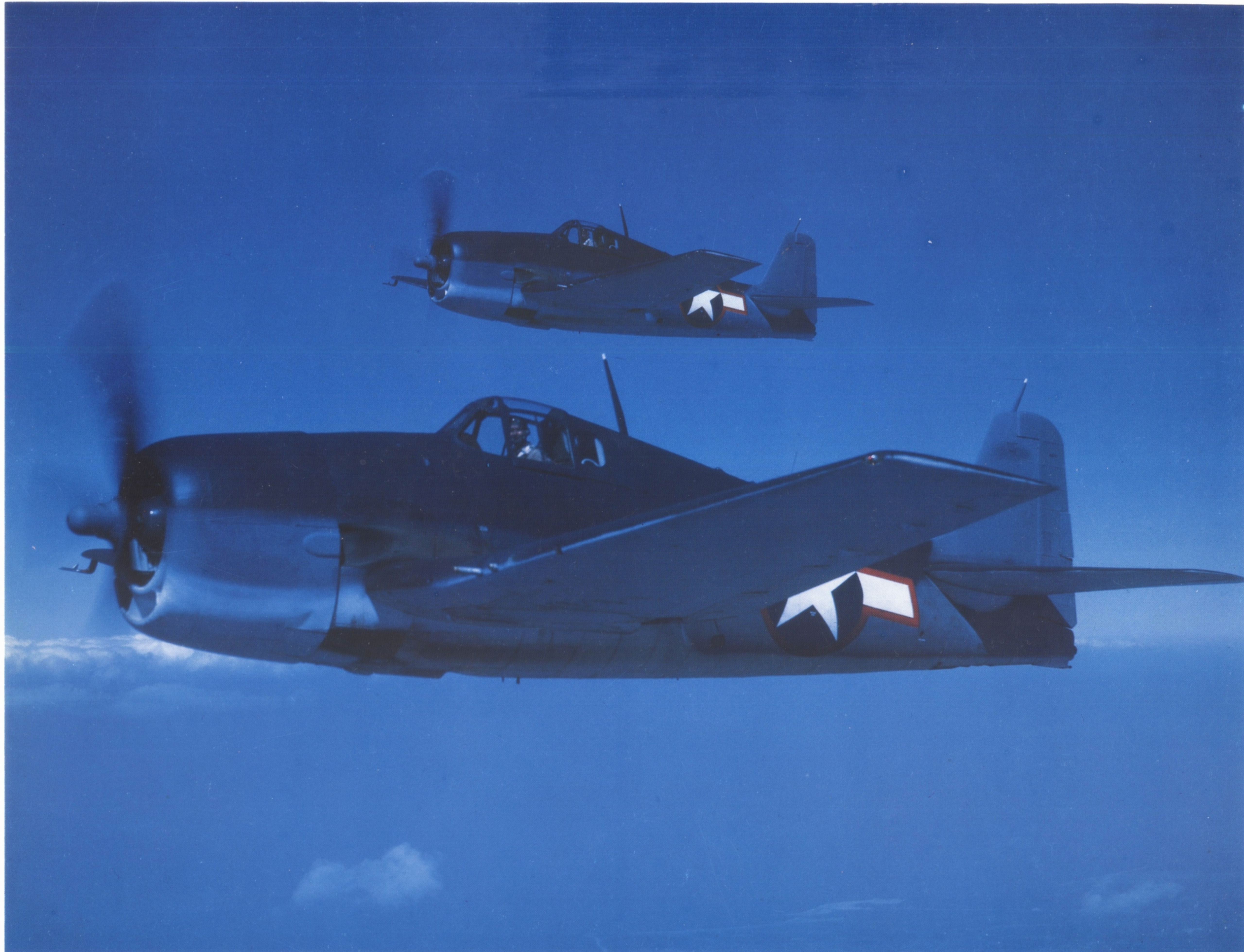
PROPULSION

- (2) Pratt & Whitney R-2800-22
2,100-hp engines
- (2) Hamilton Standard three-blade
hydromatic propellers



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F6F HELLCAT

Grumman's lethal carrier based fighter the F6F *Hellcat* compiled an overall kill ratio of 19:1 during WWII combat action and bolstered American air superiority in the Pacific. The single-seat F6F first saw action with the U.S. Navy squadron's VF-5 of *Yorktown* and VF-9 of *Essex*, conducting strikes on the Marcus Islands in August 1943. *Hellcats* distinguished themselves during the First Battle of the Philippine Sea in June 1944 by shooting down close to 300 enemy aircraft and smashing the Japanese attack.

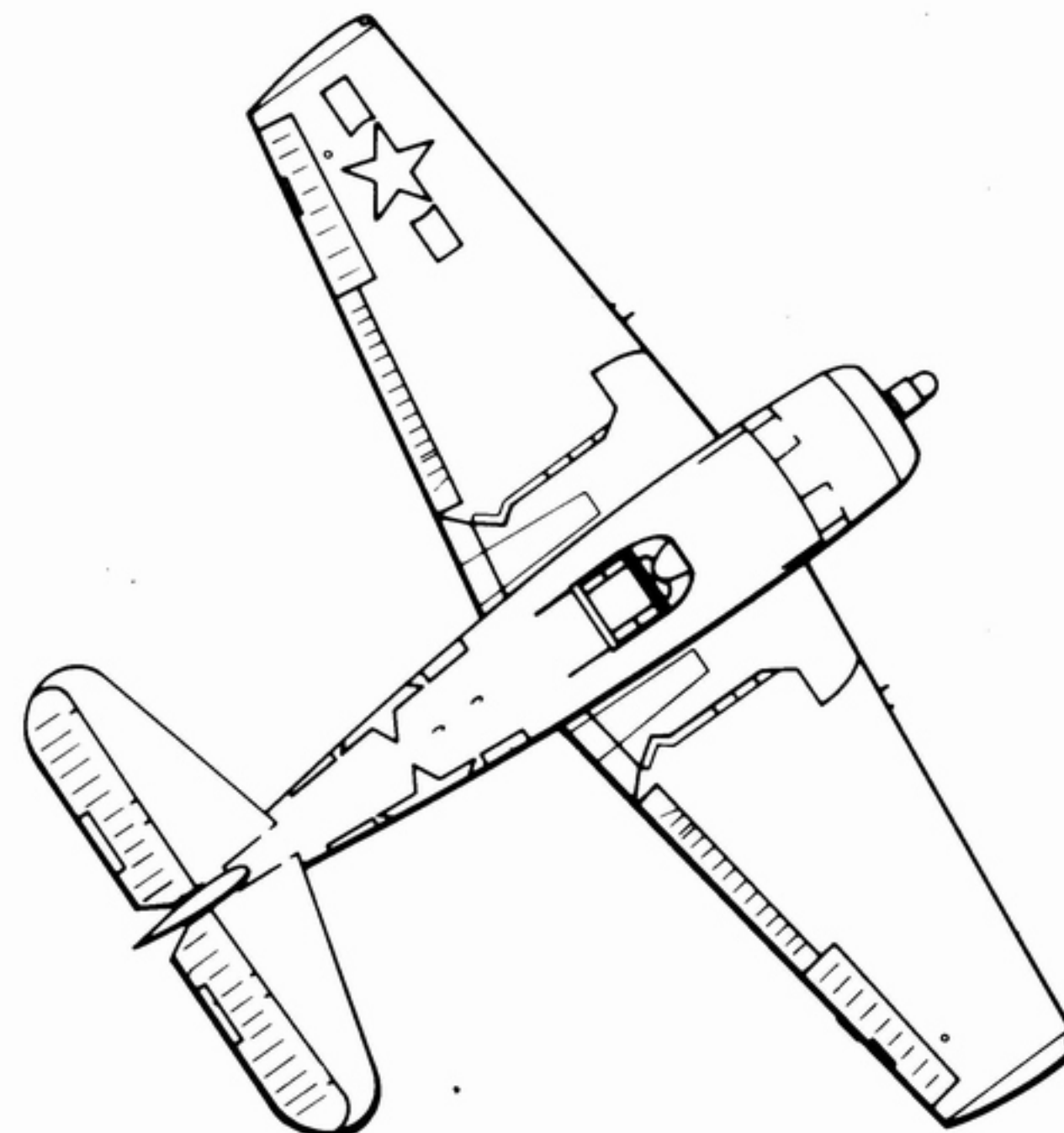
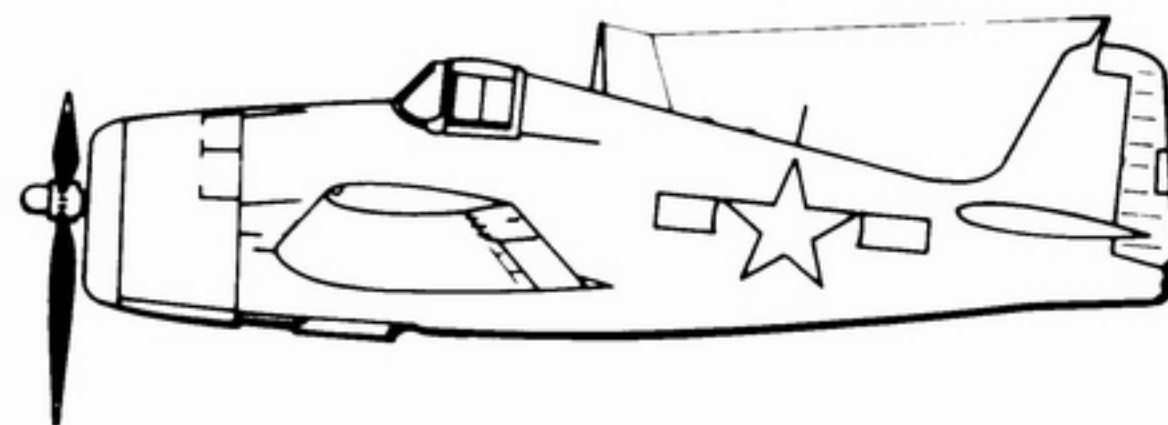
Almost 75% of the Navy's air-to-air victories in WWII were attributed to the *Hellcat*. As the war progressed, F6Fs served with U.S. Marine Corps squadrons and the Royal British Navy's Fleet Air Arm. A Marine nightfighter squadron equipped with radar-enhanced F6F-5Ns was credited with 35 kills, the best record of any nightfighter squadron in the Pacific.

Production of the rugged semi-monocoque *Hellcats* ceased in November 1945. In delivering 12,275 of these sturdy aircraft, Grumman set a

number of U.S. production records, including one for the most planes of a single type built in one month, 605 in March 1945.

Hellcats exhibited prowess during peacetime operations as well. When the U.S. Navy's precision flying team the Blue Angels was established following WWII, they made their debut flying Grumman *Hellcats*.

When the Korean conflict erupted, *Hellcats* were pressed into service as pilotless drones delivering 2,000-lb bombs against North Korean targets. The French used *Hellcats* as ground-attack aircraft against the Communist rebels in Vietnam. Their last reported use in first line service was with the Argentine and Uruguayan navies in 1959.



F6F-3 SPECIFICATIONS

DIMENSIONS

Wing span 42 ft 10 in.
Length 33 ft 10 in.
Height 14 ft 5 in.

WEIGHT

Empty 9,023 lb
TOGW 12,415 lb

PERFORMANCE

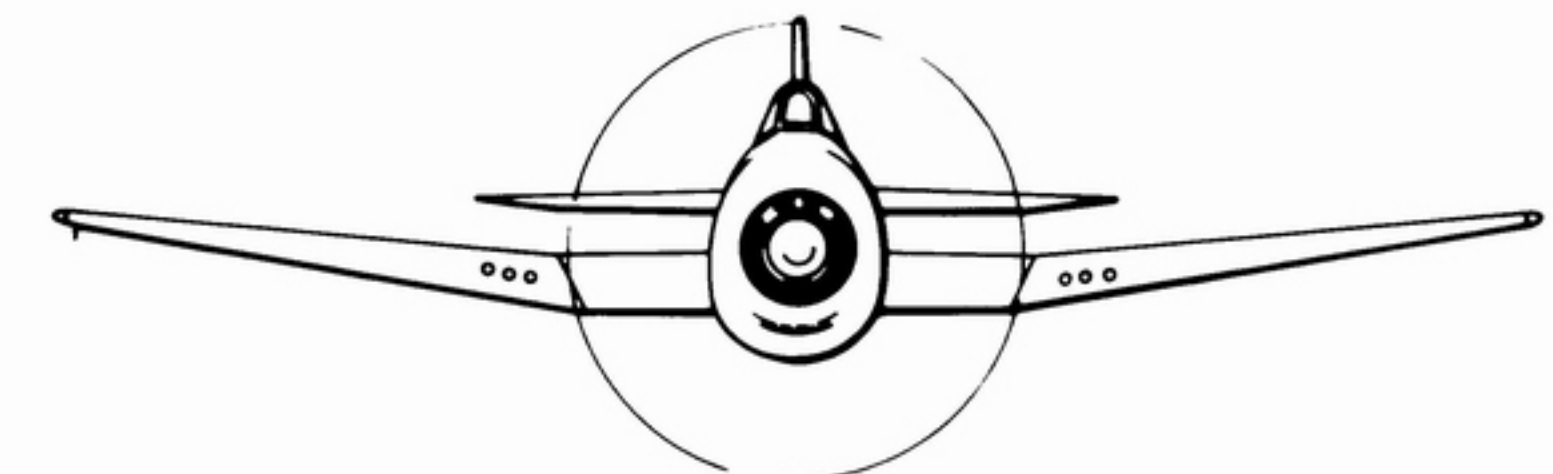
Max. speed 450 kt
Cruise speed 230 kt
Service ceiling 39,400 ft
Range 2,129 n mi

ARMAMENT

(6) .50-caliber machine guns
(2) 1,000-lb bombs

PROPULSION

(1) Pratt & Whitney R-2800-10 radial piston engine with 2,000-lb horsepower
(1) Hamilton Standard 3-blade constant speed propeller



Grumman Aerospace Corporation

Bethpage, New York 11714



F8F BEARCAT

Originally intended as a higher performance *Hellcat* derivative, the smaller, lightweight XF8F-1 first flew from Bethpage, N.Y., on August 31, 1944, piloted by Robert Hall. Powered by an R-2800-22W engine, its top speed was 424 mph at sea level, with an initial climb rate of 4800 ft/min, considerably in excess of the earlier F6F *Hellcat*. Production aircraft, powered by the R-2800-34W engine, began to be delivered during February 1945, with VF-19, the first Navy operational squadron, commencing training on May 21, 1945. The end of World War II, however, precluded deployment of the *Bearcat* into combat.

Continued product improvement produced the F8F-2 in 1948. This version incorporated 20 mm cannon (as did the earlier F8F-1B), revised cowling and taller fin and rudder, along with other minor improvements. A total of 24 squadrons flew the *Bearcat* by late 1948.

Although U.S. Navy combat service never materialized, surplus *Bearcats* were used in the mid-1950s Indo-China war, having been supplied to the French *Armée de l'Air*, and later, the Royal Thai Air Force. Some surviving French *Bearcats* served with the 514th Fighter Squadron of the Republic of Vietnam Air Force.

Including the two prototypes, a company demonstrator, and Al Williams' *Gulfhawk IV*, Grumman had produced 1265 F8Fs when production ended in May 1949.

The *Bearcat* set a climb record on November 20, 1946 that held for several years — 10,000 ft in 94 seconds, after a takeoff run of but 115 ft. On August 16, 1969, a modified *Bearcat*, *Conquest II*, captured the piston engine World Air Speed Record at 483.041 mph, flown by Darryl Greenamyer. The *Bearcat* was also used by the U.S. Navy's Blue Angels flight demonstration team, and continues today as a superb Unlimited Class closed course racer.

F8F-1 SPECIFICATION

PERFORMANCE

Max. speed.421 mph at 19,700 ft
Cruise speed.163 mph
Rate of climb. . . .4570 ft/min
Service ceiling. . .38,700 ft
Range.1105 st mi

ARMAMENT

Four 50-cal machine guns
(Four 20-mm cannons — F8F-1B)

DIMENSIONS

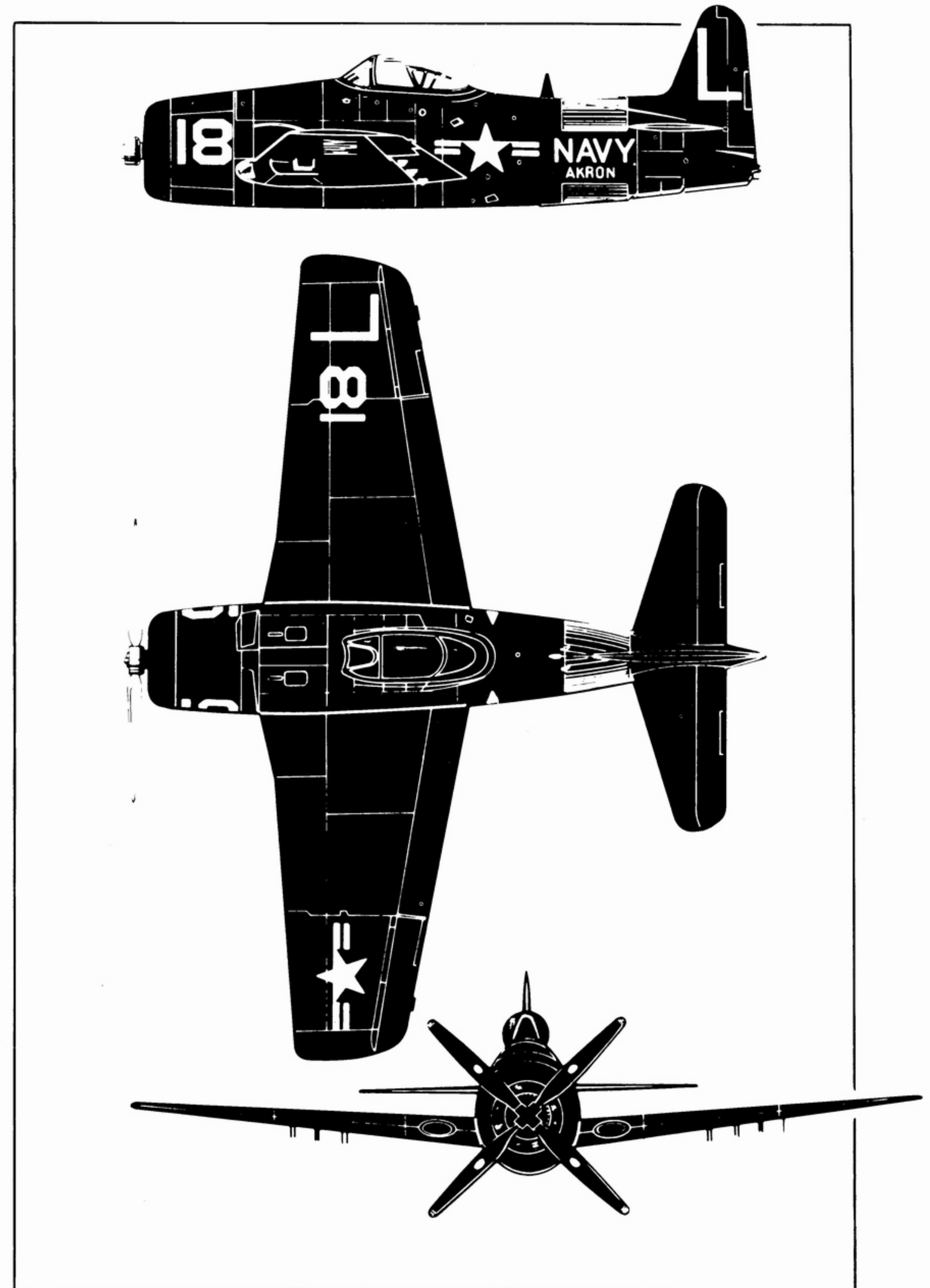
Span.35 ft 10 in.
Length.28 ft 3 in.
Height.13 ft 10 in.
Wing area. . . .244 sq ft

WEIGHT

Empty.7070 lb
Gross.12,947 lb

POWER PLANT

2100 hp Pratt & Whitney
R-2800-34W



GRUMMAN AEROSPACE CORPORATION



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F8F-1 SPECIFICATION

PERFORMANCE

Max. speed421 mph at 19,700 ft
Cruise speed163 mph
Rate of climb4570 ft/min
Service ceiling . . .38,700 ft
Range1105 st mi

ARMAMENT

Four 50-cal machine guns
(Four 20-mm cannons — F8F-1B)

DIMENSIONS

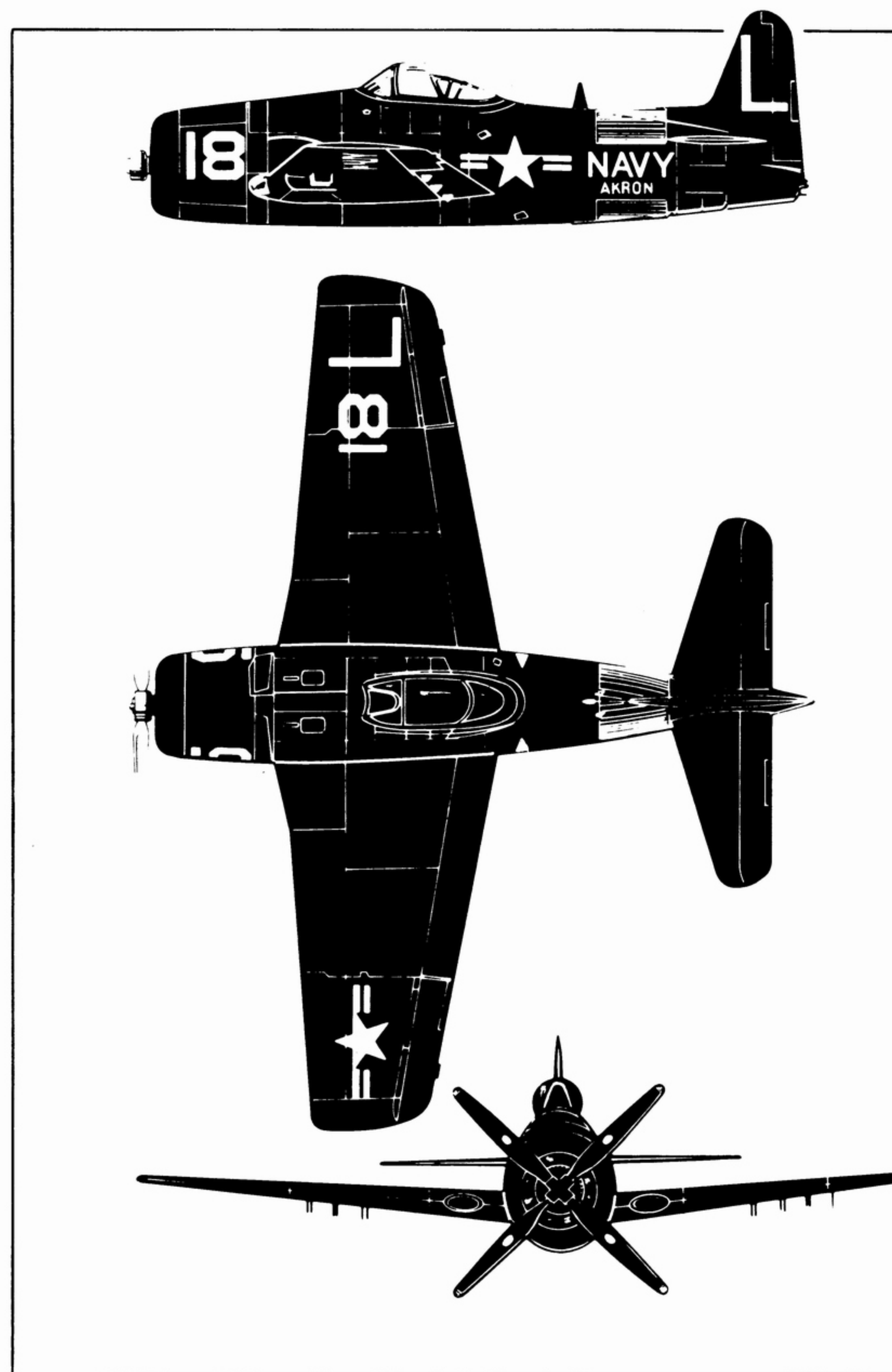
Span35 ft 10 in.
Length28 ft 3 in.
Height13 ft 10 in.
Wing area . . .244 sq ft

WEIGHT

Empty7070 lb
Gross12,947 lb

POWER PLANT

2100 hp Pratt & Whitney
R-2800-34W



Grumman Aerospace Corporation

Bethpage, New York 11714



ALBATROSS

First flown on October 1, 1947, the SA-16 *Albatross* (redesignated HU-16) entered military service in July 1949. More than 450 of these versatile amphibians have been delivered to the United States Air Force, Navy, Coast Guard, and the flying services of many foreign governments, including Argentina, Brazil, Canada, Chile, Indonesia, Italy, Japan, Mexico, Nationalist China, Norway, Pakistan, Peru, The Philippines, Portugal, Spain, Thailand, and West Germany.

During its almost 30 years of operation, the *Albatross* has become known the world over, and has been widely acclaimed for its dramatic role in air-sea rescue work. During the Korean War alone, the *Albatross* was credited with saving the lives of more than 900 men. Less publicized, perhaps, but also vitally important, are the many other missions for which the *Albatross* has proven so highly effective — ASW, ambulance, cargo and personnel transport, escort, search, and patrol. The *Albatross*, in service throughout the world, has established itself as an invaluable tool in humanitarian endeavor, economic development and national defense. Ruggedness and dependability (Grumman attributes) have become its trademark. Grumman has designed and produced more amphibians than all other manufacturers in the world combined. The *Albatross* is rugged, durable, and has been described by its pilots as a "good boat" and a "forgiving airplane." Its excellent safety record testifies to the true flying qualities, structural integrity and superior hull design always built into Grumman products.

The *Albatross* has flown well over two million flight hours; over 6,000 pilots have occupied its cockpits while flying this remarkable and unique amphibian.

The end of U.S. Navy operational flying for the *Albatross* came at the end of September 1976, a little more than 25 years from the time it first went into service with that service. The last operational *Albatross* will now go on exhibition in the Naval Aviation Museum in Pensacola, Florida, with many other famous naval aircraft.

HU-16B SPECIFICATION

PERFORMANCE

Max. Speed205 knots
Best Cruise Speed130 knots
Max. Endurance Speed . . .108 knots
Stall Speed64 knots
Service Ceiling21,500 ft
Range2850 miles

ACCOMMODATIONS

Crew of five
Ambulance.12 litters
Transport.10-22 psgrs

DIMENSIONS

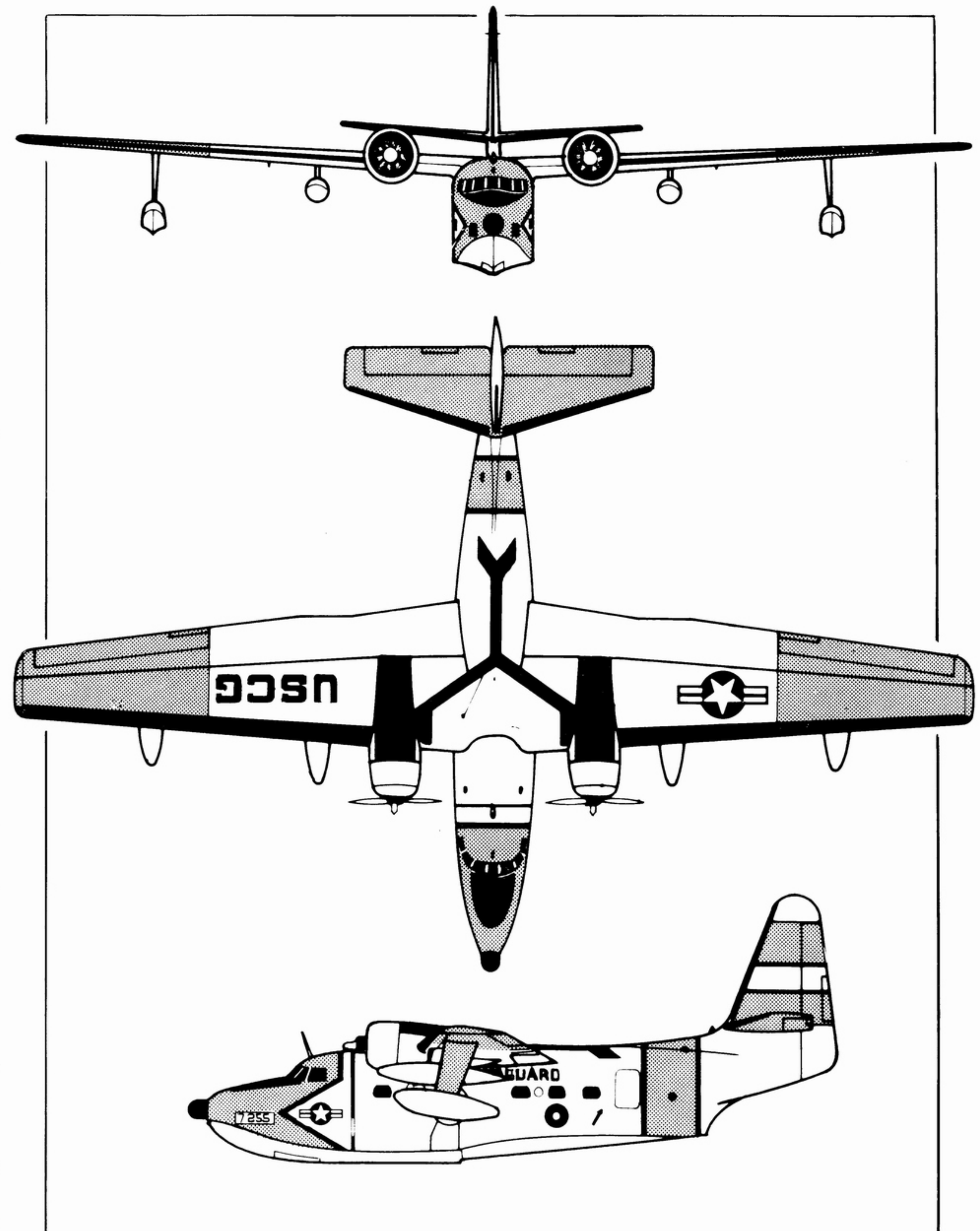
Span96 ft 8 in.
Length61 ft 3 in.
Height25 ft 10 in.
Wing Area1035 sq ft

POWER PLANT

Two 1425 hp Curtiss-Wright
R-1820-76 or
Two 1525 hp Curtiss-Wright
R-1820-82

WEIGHT

Empty.22,883 lb
Gross32,000 lb



GRUMMAN AEROSPACE CORPORATION



S-2 TRACKER

A 23-year operational service life with the U.S. fleet came to an end on 28 August 1976, when the last fleet-operational Grumman S-2 *Trackers* were officially retired by VS-37 at the San Diego Naval Air Station.

Winner of an ASW competition in June 1950, the XS2F-1 (Design G-89) first flew on 4 December 1952. It was the first aircraft design to combine the detection equipment and armament to hunt and destroy submarines — and operate from an aircraft carrier. The S2F-1, in 1954, was the first airplane to be launched by the new steam catapult from the deck of an American carrier — the U.S.S. *Hancock*.

Production deliveries commenced in 1953 — 1342 aircraft were eventually to be produced, through 16 configurations, including the S-2A, S-2B, S-2C, S-2D, S-2E, S-2F and S-2G *Trackers*, the C-1A and EC-1A *Traders*, and the E-1B *Tracer*. Other conversions include the TS-2A, US-2C and RS-2C. An enlarged torpedo bay, enhanced passenger and cargo capacity, longer range radar detection capability, and continual upgrading of electronic capabilities marked the development of the S-2 series. Including over 60 CS2Fs built in Canada under license, deliveries to foreign nations totaled 342 *Trackers*. In addition to the U.S. Navy's many squadrons, *Trackers* have flown from the carriers of the Royal Canadian Navy, the Royal Australian Navy, the Royal Netherlands Navy, the Brazilian Navy, and the Argentine Navy; they supply the ASW capability for Italy, Turkey, Peru, Chile, Norway, Germany, Columbia, Spain, and Japan.

U.S. Navy *Trackers* have flown over seven million hours and made over 800,000 carrier landings — all with an accident rate one-seventh of the overall Navy accident rate — one of the safest planes ever to be used by the fleet. But the *Tracker*, used for so long into the jet age, still has not outlived its usefulness. It continues serving as the TS-2A trainer, as a fully operational aircraft with other friendly air forces, as a COD cargo and personnel carrier and, as so many Grumman "Iron Works" products before it, in the vital job of saving our forests from the ravages of fire.

S-2D SPECIFICATION

DIMENSIONS

Span 72 ft 7 in.
Span folded 27 ft 4 in.
Length 43 ft 6 in.
Height 17 ft 6 in.
Wing area 499 sq ft

PERFORMANCE

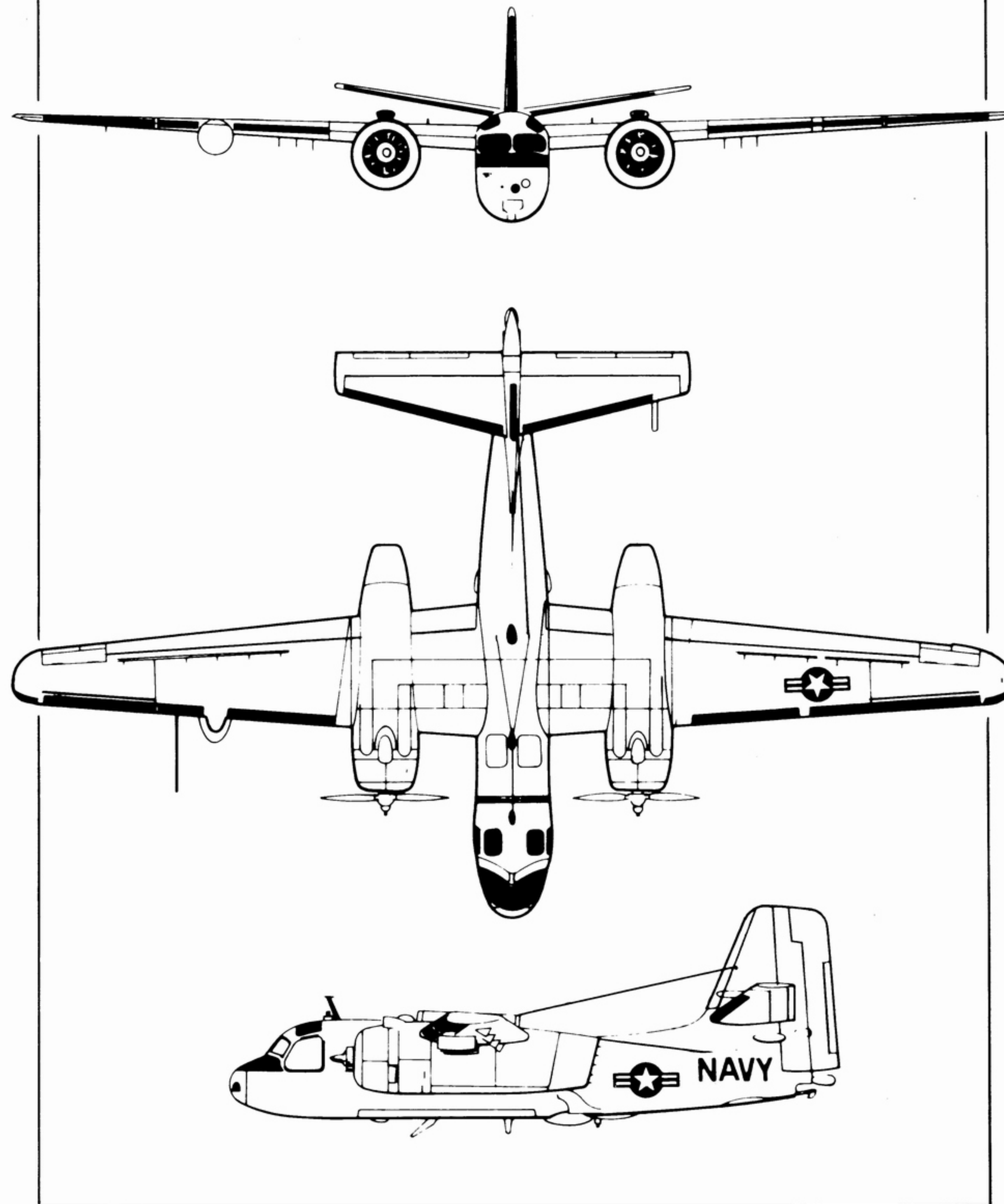
Max. Speed 280 mph
Patrol Speed 150 mhp at 1500 ft
Service ceiling 22,000 ft
Takeoff 1112 ft
Max. range 1350 st mi
Max. endurance 9 hours

WEIGHT

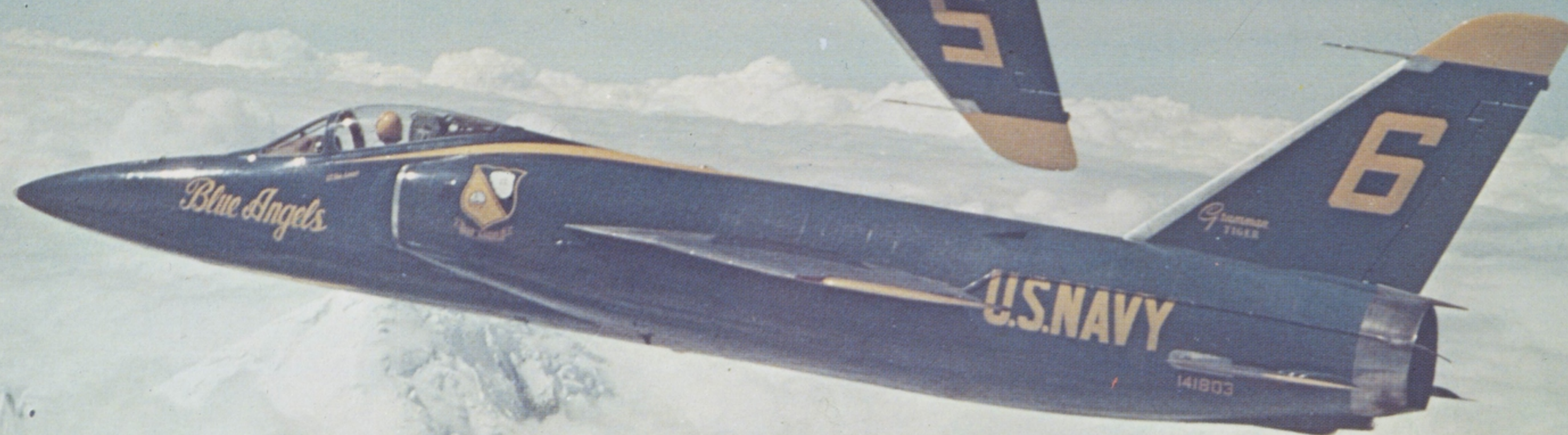
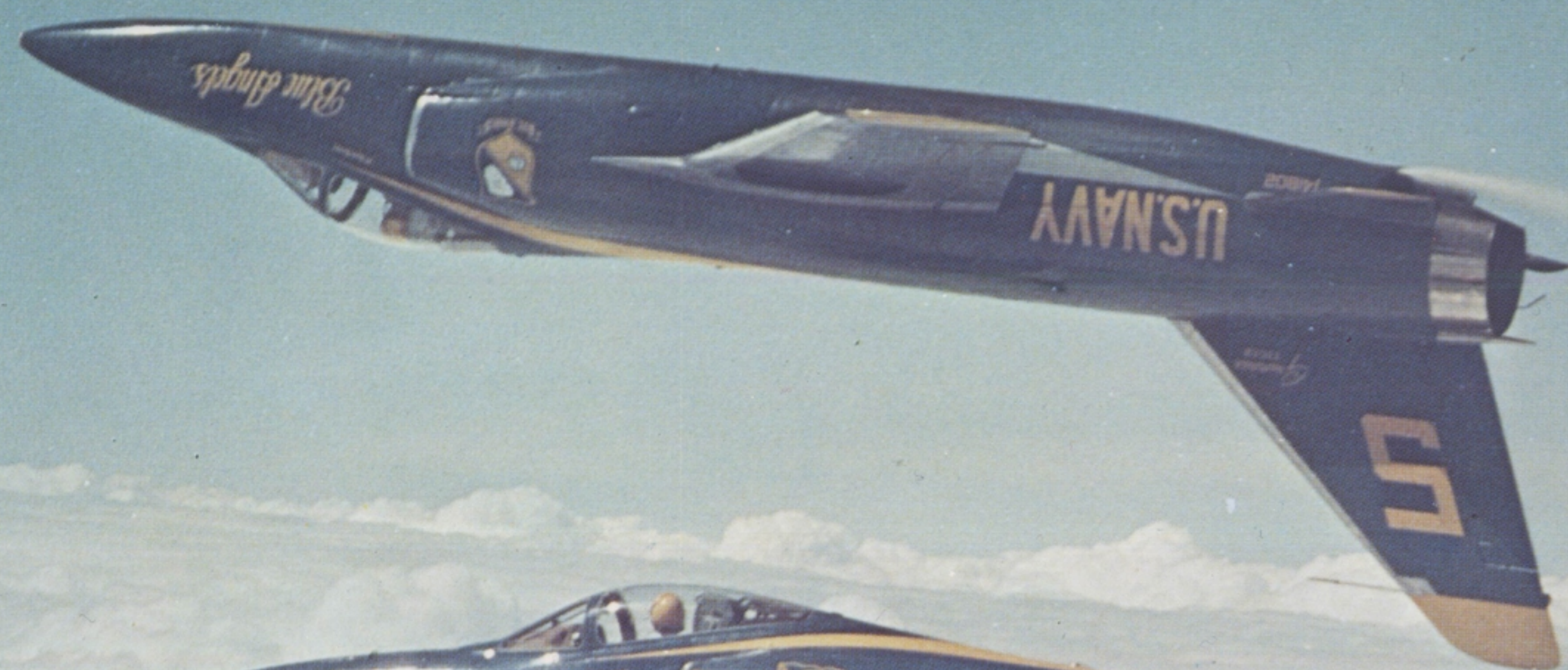
Empty 18,315 lb
Max. TOGW 26,147 lb

PROPULSION

(2) Wright R-1820-82 1525 hp



GRUMMAN AEROSPACE CORPORATION



F-11A TIGER

The F-11A *Tiger* first flew on July 30, 1954. Originally designated F9F-9 (as a *Cougar* variant) it was subsequently redesignated F11F-1 from the sixth aircraft on. The *Tiger* was the first aircraft to use the NACA-developed "area rule" concept from design inception; this concept is more familiarly known as the "Coke bottle" fuselage. It was also the first carrier-borne single-seat fighter with supersonic capability. The Grumman attributes of simplicity and ruggedness were stressed in the design of the *Tiger*. The top and bottom wing skins were machine milled from single slabs of aluminum, greatly reducing the number of parts, time and expense usually involved in complex wing assembly. The wings also served as integral fuel tanks. Also installed were dual independent hydraulic power control systems, without complicated trim or mechanical back-up systems.

Deliveries of production aircraft began with assignment to VA-156, a combined fighter-attack squadron, in March 1957. Production continued through December 1958; the last of 201 built was delivered on January 23, 1959. Five first-line squadrons were equipped with the *Tiger*, two in the Atlantic Fleet and three in the Pacific Fleet. The Navy's Blue Angels aerobatic team used *Tigers* for more than 10 years. During 1959, the *Tiger* began to be phased out of front-line service, being assigned to the Advanced Training Command.

Two airplanes were modified (F11F-1F) with the 15,000-lb thrust J79-GE-3A and in 1956 one set unofficial world speed and altitude records of 1220 mph (Mach 1.85) at 40,000 ft, and reached an altitude of more than 70,000 ft.

In 1975, an ex-Blue Angel *Tiger* was modified to incorporate an inflight thrust reverser; a series of test flights successfully proved the feasibility of such a device.

Today, a *Tiger* is on permanent display at the U.S. Naval Aviation Museum in Pensacola, Florida; another is at the Naval Air Station, Lakehurst, New Jersey.

F-11A SPECIFICATION

DIMENSIONS

Span 31 ft 7½ in.
Span folded . . . 27 ft 4 in.
Length 44 ft 6 in.
Height 13 ft 3 in.
Wing area 250 sq ft

WEIGHT

Empty 13,307 lb
Normal loaded . . 21,035 lb

PERFORMANCE

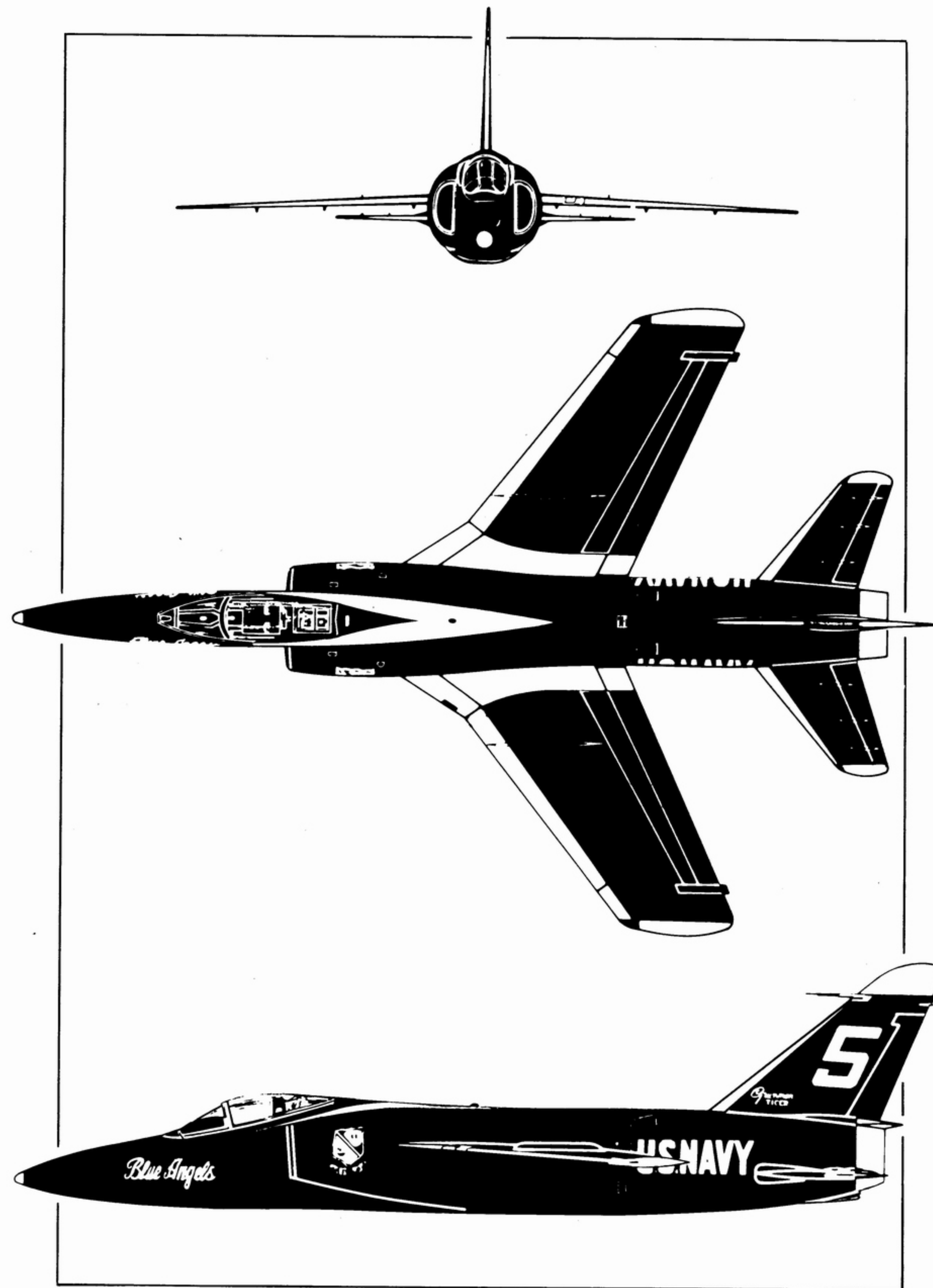
Max. speed 654 knots at SL
Cruise speed . . . 502 knots at 38,000 ft
Landing speed . . . 130 knots
Rate of climb . . . 5130 fpm
Service ceiling . . 41,900 ft
Max. range 1108 n mi

POWERPLANT

One Wright J65-W-18 W/afterburner
10,500 lb thrust

ARMAMENT

Four 20mm cannon plus
Four Sidewinder missiles



GRUMMAN AEROSPACE CORPORATION



E-2C HAWKEYE

The E-2C *Hawkeye*, in service with the U.S. Navy and several foreign governments, is the latest airborne early warning command and control aircraft built by Grumman. This advanced version -- the result of progressive airframe, propulsion, and systems development over the past 20 years -- represents the state-of-the-art in airborne early warning command and control. The E-2C's ability to detect targets over land and over water at long ranges, coupled with high reliability, will provide the AEW&CC capability needed for operations through the 1990s.

This all-weather carrier- and shore-based system is primarily designed for air defense. Secondary mission capabilities include surface surveillance, strike control, search and rescue, air traffic control, and communications relay.

Hawkeye's crew consists of a pilot, co-pilot, a combat information center officer, an air control

officer, and a radar operator. Control capability is tripled since the three operators can work independently in all modes: sensor display, data retrieval, and automatic control.

E-2C's service with the fleet has been impressive, having demonstrated the highest degree of operational readiness of any carrier-based aircraft. *Hawkeye's* capabilities have attracted interest in a number of foreign countries. The governments of Israel and Japan have already taken delivery of E-2C *Hawkeyes* and several other international sales have been made. Many other countries throughout the world are considering the E-2C for their air defense systems. Built-in advantages for land-based operations include excellent unimproved field capability along with compact size and storage (the wings fold). Economical twin turboprop powerplants enable short-runway operations, low search speeds, and long missions.

DIMENSIONS

Span 80 ft 7 in. (24.6 m)
Length 57 ft 8 in. (17.6 m)
Height 18 ft 4 in. (5.6 m)
Wing area 700 ft² (65.03 m²)

WEIGHT

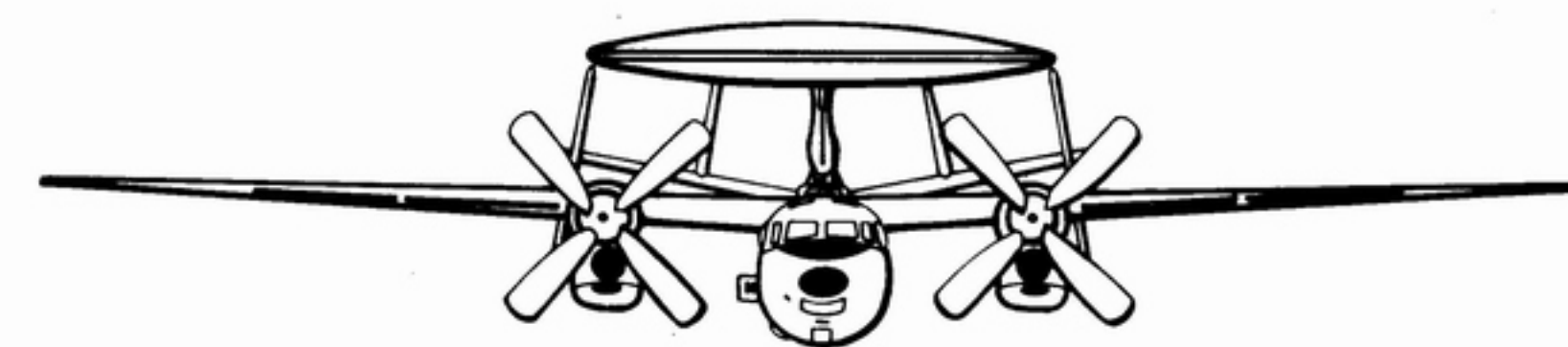
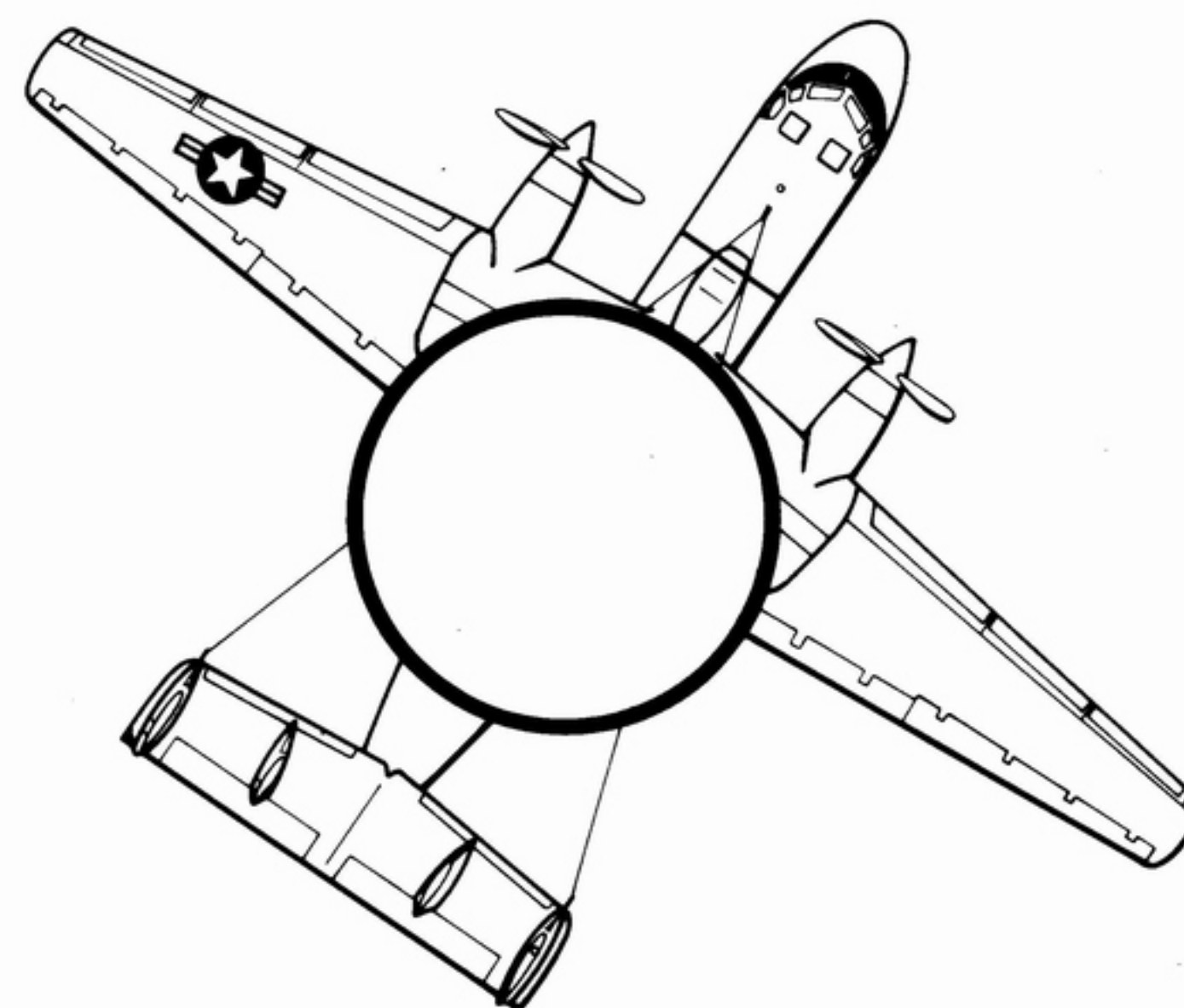
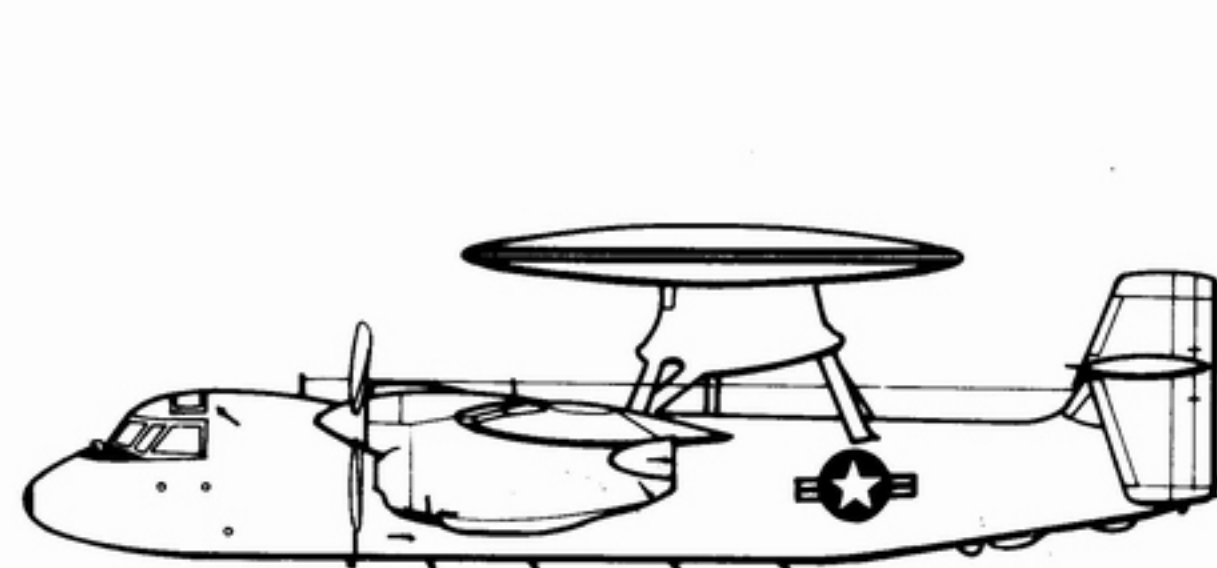
Empty 38,063 lb (17,265 kg)
Max fuel (internal) 12,400 lb (5,625 kg)
Max TOGW 51,933 lb (23,557 kg)

PERFORMANCE

Cruising speed 269 kt (498 km/hr)
Service ceiling 30,800 ft (9,388 m)
Ferry range 1,394 n mi (2,582 km)
Takeoff run 1,900 ft (579 m)

PROPULSION

(2) Allison T56-A-425A turboprop engines, 4,910 ESHP each



Grumman Aerospace Corporation

Bethpage, New York 11714



02

VMAQ-2
MARINES

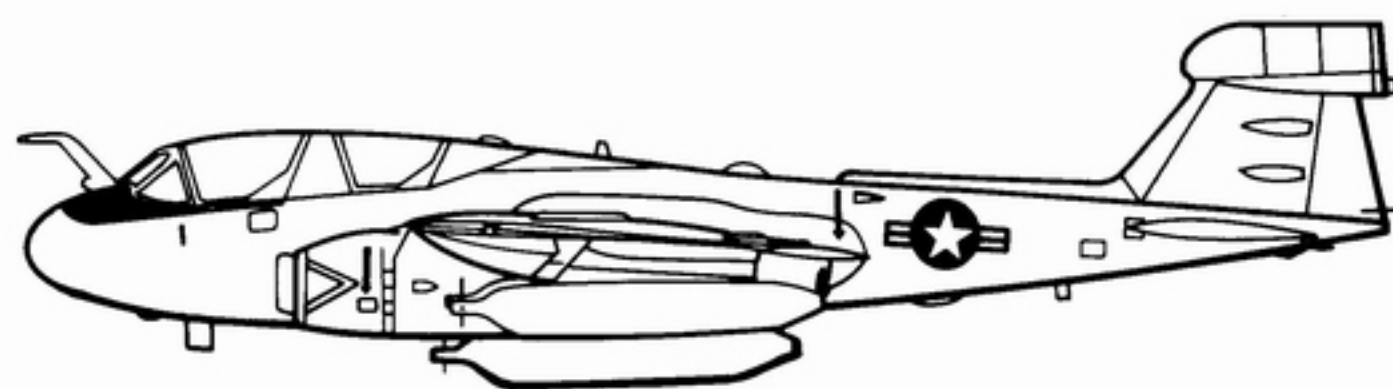
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02

EA-6B PROWLER

The EA-6B *Prowler*'s primary mission for the Navy And Marines is to protect fleet surface units and strike aircraft by jamming enemy radars and communications. A derivative of the two-place A-6 *Intruder*, the EA-6B, which joined the fleet in 1971, was lengthened to accommodate a four-place cockpit.

Surveillance receivers in the tail fin pod can detect radars at long ranges. Emitter signals feed into a computer that processes them for display and recording. Detection, identification, direction-finding, and jammer-set-on-sequence can be performed automatically or by the crew. The *Prowler* can carry five integrally powered pods with a total of 10 jamming transmitters each covering one of seven frequency bands. Two electronic countermeasures officers operate the jammers from the aft cockpit. A third ECMO in the right front seat is responsible for communications, navigation, and defensive electronic countermeasures.

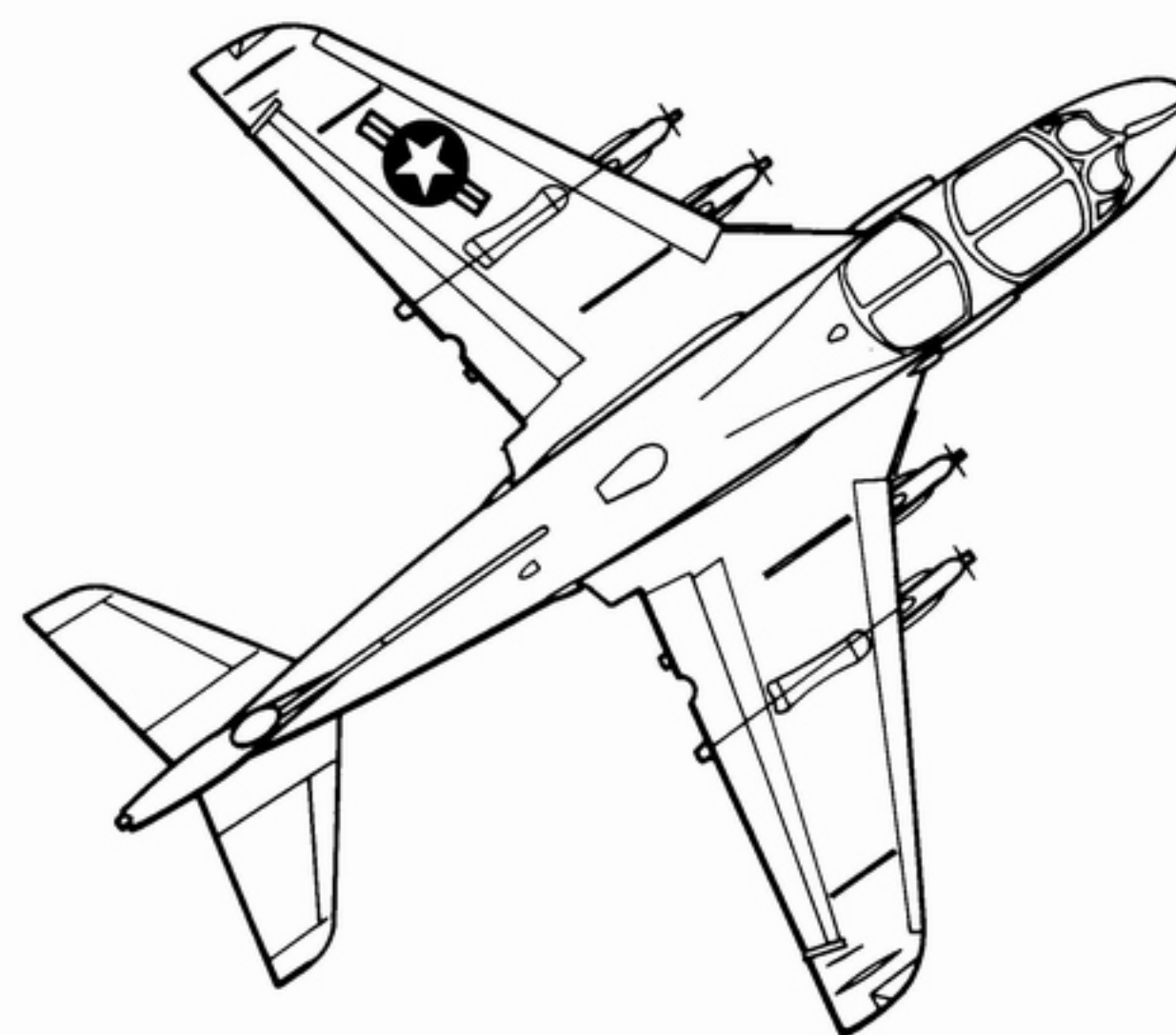


Several update programs have kept pace with the dynamic threat and changing mission roles. The latest deployed configuration, called "Improved Capability-2," or ICAP-2 Block '86, features improved modulation techniques and increased jamming flexibility. The EA-6B's "weapon," the ALQ-99, has also been improved and now jams with far greater effectiveness than previous systems.

The next major *Prowler* improvement is being done in three phases. *ADV-CAP* (Advanced-Capability) is in the final stages of full-scale development and will be integrated with the *VEP* (Vehicle Enhancement Program) and *AIP* (Avionics Improvement Program) to formulate the ADVCAP Block '91 Remanufacture Program. Delivery of the first remanufactured aircraft is scheduled for mid-1996.

Dimensions:

- ☐ Wing span 53 ft, 0 in.
- ☐ Wing span (folded) 25 ft, 10 in.
- ☐ Length 59 ft, 10 in.
- ☐ Height 16 ft, 8 in.



Weight:

- ☐ Empty 34,300 lb
- ☐ Internal fuel 15,419 lb
- ☐ External fuel 10,025 lb
- ☐ Max TOGW 61,500 lb

Performance:

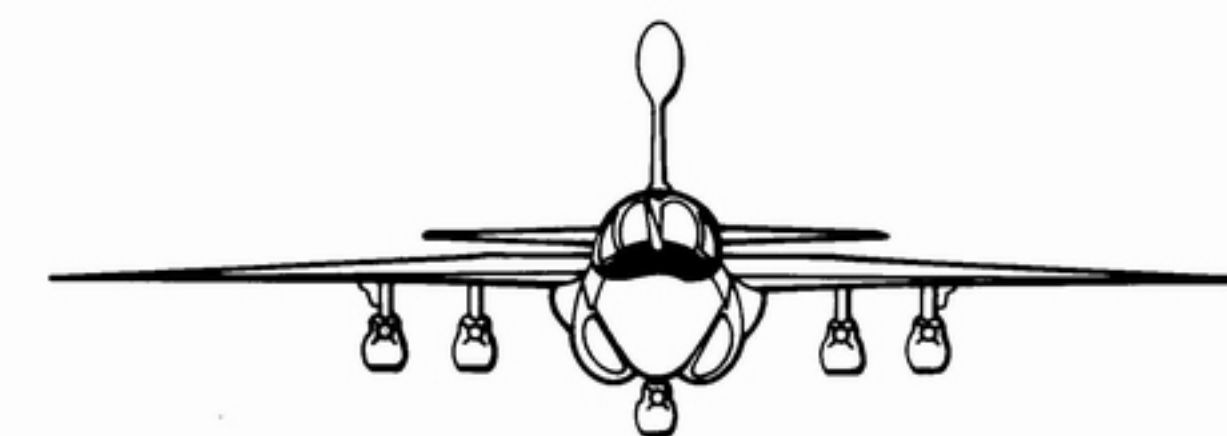
- ☐ Min takeoff distance 2,750 ft
- ☐ Max speed 541 kt
- ☐ Cruise speed 418 kt
- ☐ Service ceiling 37,600 ft
- ☐ Ferry range (5 drop tanks) 1,747 nm
- ☐ Approach speed 122 kt
- ☐ Min landing distance 2,185 ft

Armament:

- ☐ HARM (High-Speed Anti-Radiation Missile) for attacking ground based radar installations

Propulsion:

- ☐ Two Pratt & Whitney J52-P-408A turbojet engines, 11,200-lb thrust each



GRUMMAN®



F-14 TOMCAT

The F-14A Tomcat is an integral part of a long tradition of Grumman fighters for the U.S. Navy. It is the world's first operational air superiority fighter with a variable-sweep wing. The wing is automatically positioned for best lift performance throughout the flight envelope. With its twin afterburning turbofan engines producing over 40,000 lb of thrust, the F-14 can attain speeds greater than Mach 2.

The versatility provided by *Tomcat's* variable-sweep wing and AWG-9 weapons control system makes it truly a multimission fighter — sophisticated enough to cope with high speed, high altitude aircraft and missile threats, agile enough to beat any threat in the dogfight arena, and sufficient range to provide escort protection for today's far-reaching attack aircraft.

Tomcat is manned by a crew of two — the pilot, and the radar intercept officer who

operates the AWG-9 weapons control system — the most capable ever carried by a fighter aircraft. It has demonstrated detection ranges of over 100 miles, track-while-scan coverage of numerous targets, multiple and simultaneous missile guidance, the ability to "look down and shoot down" at extremely small targets, and operation in an electronic warfare environment.

F-14A aircraft have been operational with the United States Navy since 1973 and currently are deployed with both the Atlantic and Pacific fleets.

Now under development, the F-14D will begin service with the Navy in the late 1980s. It incorporates a new higher thrust engine, advanced digital avionics, and an upgraded AWG-9 system — all designed to stay ahead of the threat until well after the year 2000.

DIMENSIONS

Wing Span	
Swept	38 ft 2 in.
Unswep	64 ft 2 in.
Carrier handling	33 ft 0 in.
Overall length	61 ft 11 in.
Height	16 ft 0 in.

WEIGHT

Empty	40,000 lb
Max fuel (internal)	16,200 lb
Typical TOGW	
4 Sparrow missiles	58,000 lb
6 Phoenix missiles	67,000 lb

PERFORMANCE

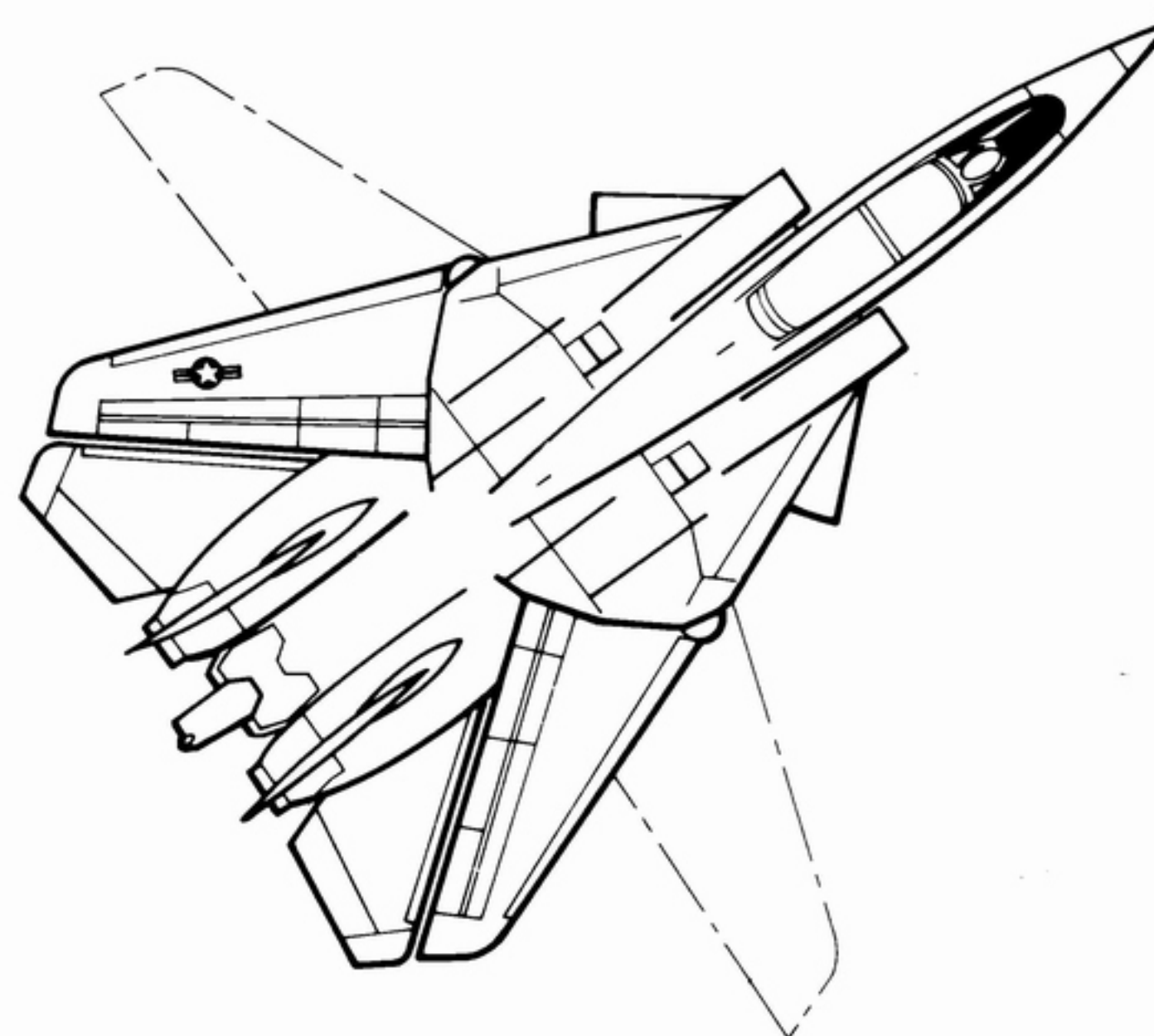
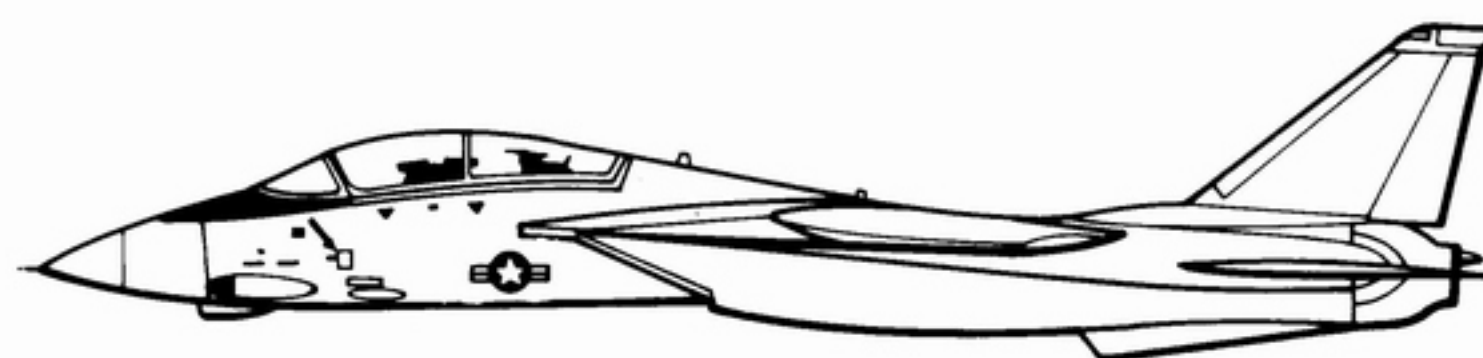
Max speed	Mach 2+
Cruise speed	400-500 kt
Approach speed	125 kt
Service ceiling	50,000+ ft
Effective combat wing loading	40-50 psf

ARMAMENT

- (6) AIM-54 Phoenix missiles
- (6) AIM-7 Sparrow missiles
- (4) AIM-9 Sidewinder missiles
- (1) M61-A1 Vulcan 20 mm cannon

PROPULSION

- (2) TF30-P414A afterburning turbofans with over 40,000 lb (total) thrust



GRUMMAN®



A-6E TRAM INTRUDER

The Grumman A-6E TRAM *Intruder* with its new radar, computer, and other improvements is the latest version of the Navy and Marine Corps attack aircraft. Crewed by a pilot and bombardier/navigator, it performs close air support, interdiction, and deep-strike missions. It can detect, identify, track, and destroy tactical targets in any weather, day or night.

This most advanced version of the A-6E incorporates a target recognition attack multisensor (TRAM) that is coupled with laser-guided weapon delivery. TRAM provides television-type imagery of targets not detectable visually or by radar.

The *Intruder's* five external store stations can carry any of more than 30 types of bombs, rockets, missiles, naval mines, or fuel tanks, up to a total capacity of 18,000 lb. The bombardier/navigator operates the weapon delivery system, allowing the pilot to concentrate on tactical decisions. Unique displays showing targets and geographical features ensure accurate weapon

delivery despite night or bad weather. Built-in test and fault isolation circuits save on equipment and maintenance man-hours.

The earliest version of this rugged, combat-proven airframe and engine combination is the A-6A, which was designed for deep interdiction, all-weather attack, and close air support. It was followed by the A-6B, configured with anti-radiation missiles for attack against surface-to-air missile sites while retaining full strike capability. Another version, the KA-6D, refuels other carrier aircraft in flight. The A-6C conversion of the A-6A was accomplished under the U.S. Navy's TRIM (Trails, Roads, Interdiction, Multisensor) program. The A-6C is configured with electro-optical sensors for strikes against non-radar significant targets. An electronic warfare derivative of the *Intruder*, the EA-6A, is in service with the Marine Corps.

DIMENSIONS

Wing span.....53 ft 0 in.
Wing span (folded).....25 ft 4 in.
Length.....54 ft 9 in.
Height.....16 ft 2 in.

WEIGHT

Empty.....26,320 lb
Internal fuel.....15,940 lb
(4) 300 gal wing tanks.....8,020 lb
Max external stores.....18,000 lb

PERFORMANCE

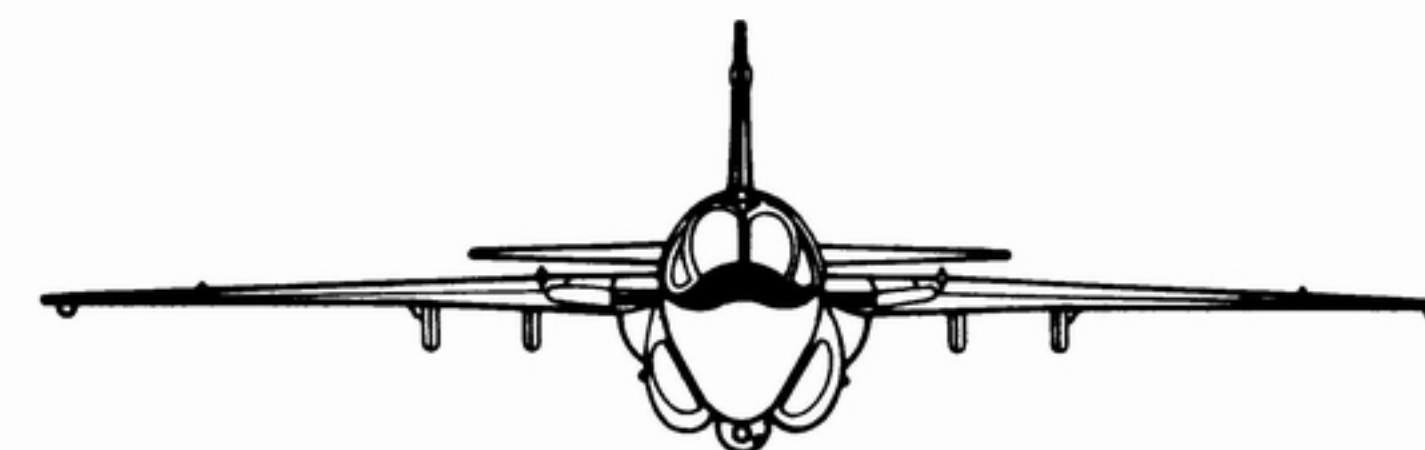
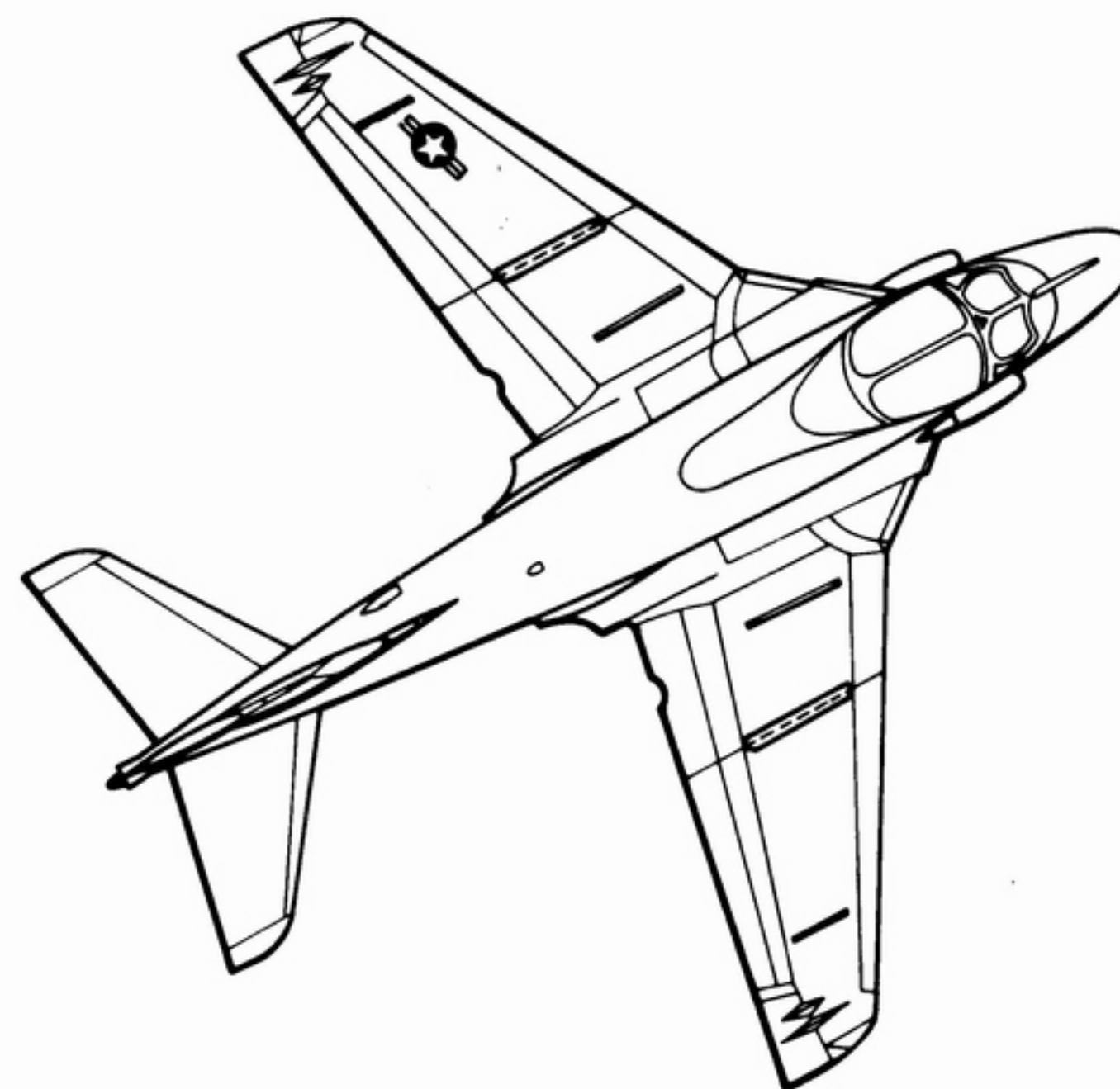
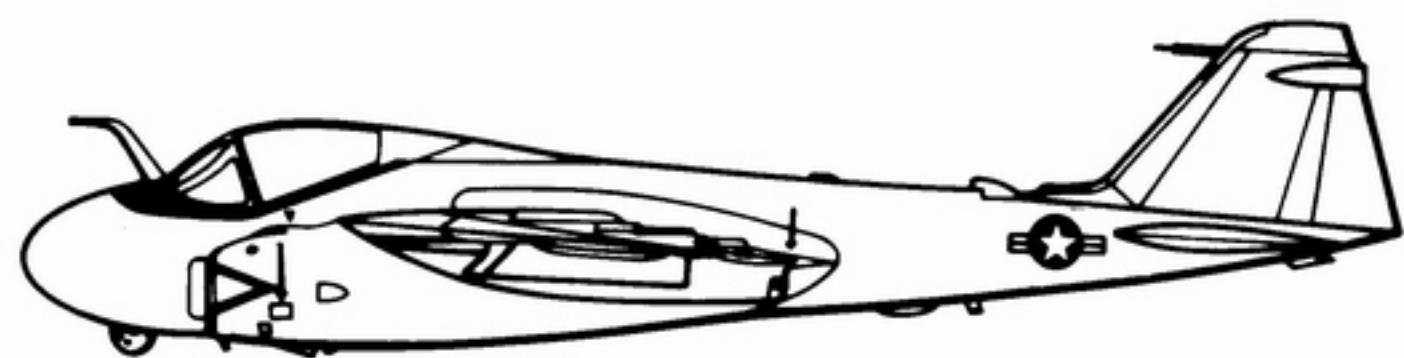
Max speed.....563 kt
Cruise speed.....415 kt
Approach speed.....111 kt
Field takeoff distance.....1,790 ft
Field landing distance.....1,860 ft
Service ceiling.....47,200 ft
Ferry range.....2,378 n mi

ARMAMENT

Bombs
Rockets
Missiles
Naval mines
Gun pods
Special weapons

PROPULSION

(2) J52 P-8A turbojets
with 18,000 lb total thrust



GRUMMAN[®]



OV-1D MOHAWK

The OV-1D Mohawk is a completely integrated battlefield surveillance system that supplies the army field commander with information on the strength, disposition, and activity of enemy forces. This two-place twin-turboprop aircraft is equipped with photographic and electronic sensors that can monitor enemy operations in daylight, darkness, and inclement weather. The OV-1D is ruggedly designed to operate from small unimproved fields in forward battle areas and can be maintained without extensive support equipment.

The external appearance of this latest Mohawk is similar to the A, B and C versions, but rapid reconfiguration provisions enable a single OV-1D to perform the surveillance functions of any previous Mohawk. In less than an hour, three photographic systems can be installed (or removed) and the radar and infrared systems can be interchanged. Thus, the D can be quickly adapted to respond to the field commander's immediate intelligence requirements.

Several additional features incorporated in the OV-1D significantly enhance its surveillance capabilities:

- ☐ An automatic data annotation system for complete identification of all sensor imagery
- ☐ A more accurate navigation system (inertial)
- ☐ Improved infrared and radar performance and displays
- ☐ A vertical panoramic camera system that photographs terrain from horizon-to-horizon
- ☐ ECM equipment for greater assurance of mission success.

Significant improvements have also been made in engine power, wing and landing gear strength, equipment accessibility, communications, and cockpit instrumentation.

DIMENSIONS

Span	48 ft
Length	41 ft
Length (with SLAR antenna)	43 ft
Height	13 ft

MISSION CONFIGURATION

WEIGHT

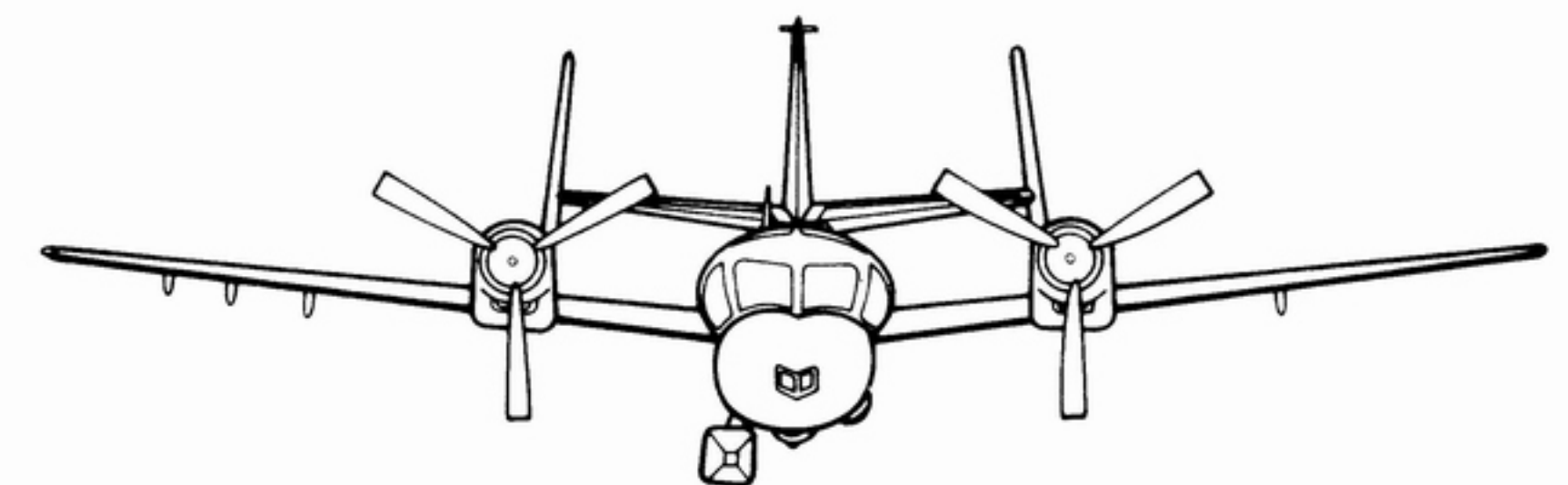
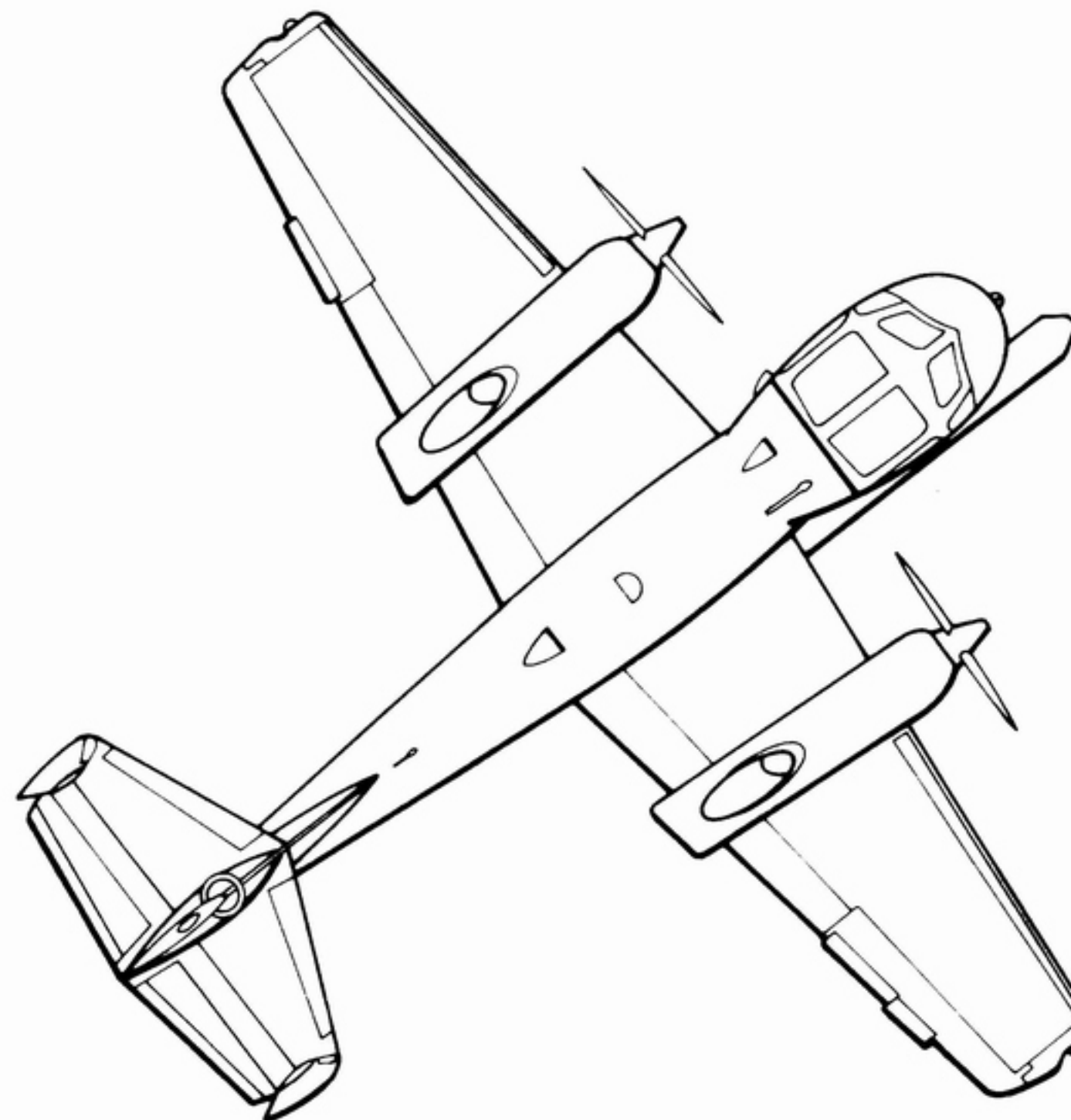
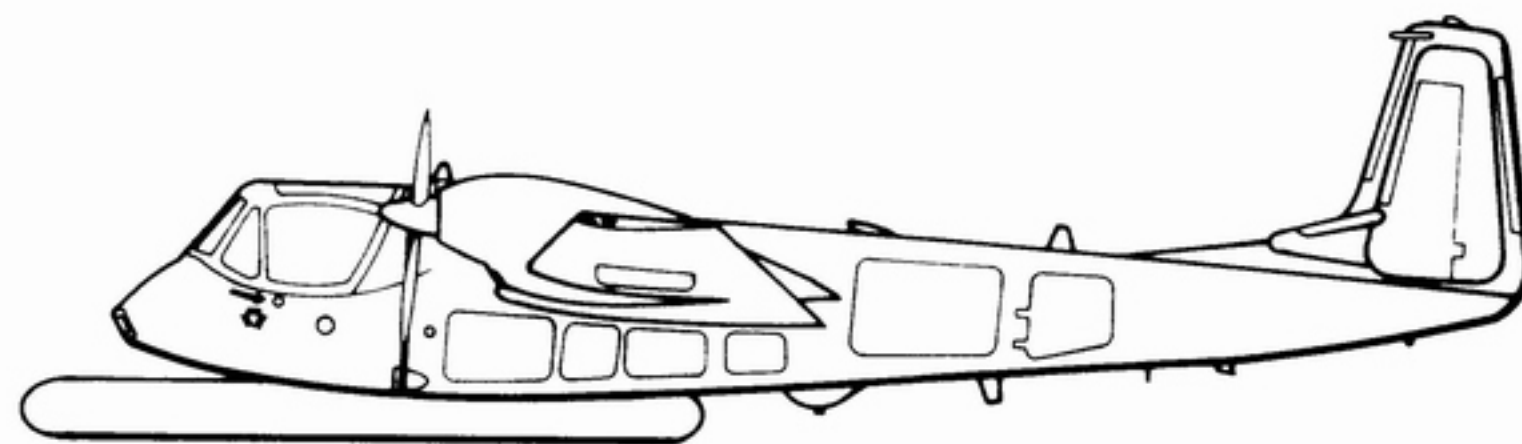
	SLAR/Photo	IR/Photo
Empty	11,800 lb	11,800 lb
Internal fuel	1,930 lb	1,930 lb
2/150 gal drop tanks	2,368 lb	2,368 lb
TOGW (extended mission) ..	17,976 lb	17,799 lb

PERFORMANCE

Max speed	251 kt	265 kt
Cruise speed	210 kt	210 kt
Service ceiling (80% fuel) ..	25,000 ft	25,000 ft
Range (w/drop tanks)	820 n mi	878 n mi

PROPULSION

(2) Lycoming T53-L-701 turboprop engines, 1400 ESHP each



GRUMMAN®



A-10 THUNDERBOLT II

The A-10 Thunderbolt II is a single-place, twin turbofan aircraft specifically designed:

- To provide effective anti-armor support for ground forces;
- To be deadly against tanks and other targets;
- To be able to carry large ordnance payloads and have excellent range and long loiter capabilities near the battle area;
- To survive intense anti-aircraft fire, surface-to-air missiles and attacks by other aircraft;
- To maintain high sortie rates and operate from short fields, while permitting rapid servicing and easy repair of battle damage.

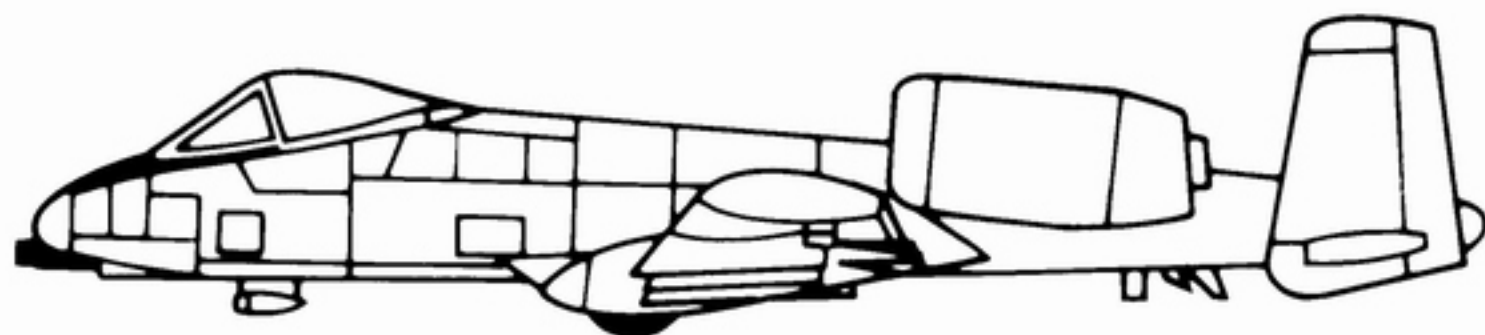
The A-10 is presently operational with the Tactical Air Command at Bases in the U.S., Europe, Alaska and Korea. A-10's also deployed with units of the Air National Guard and Air Force Reserves.

A-10 CHARACTERISTICS

RESPONSIVENESS: The versatile and flexible A-10 has large payload/long loiter/wide radius capabilities. Additionally, operating under 1,000 ft. ceilings with only one mile visibility makes it highly responsive to the needs of the ground combat commander.

LETHALITY: Mounted internally along the aircraft's center line is the GAU-8/A 30mm Gatling gun system. The GAU-8A provides a cost-effective weapon to defeat the full array of ground targets encountered in close air support.

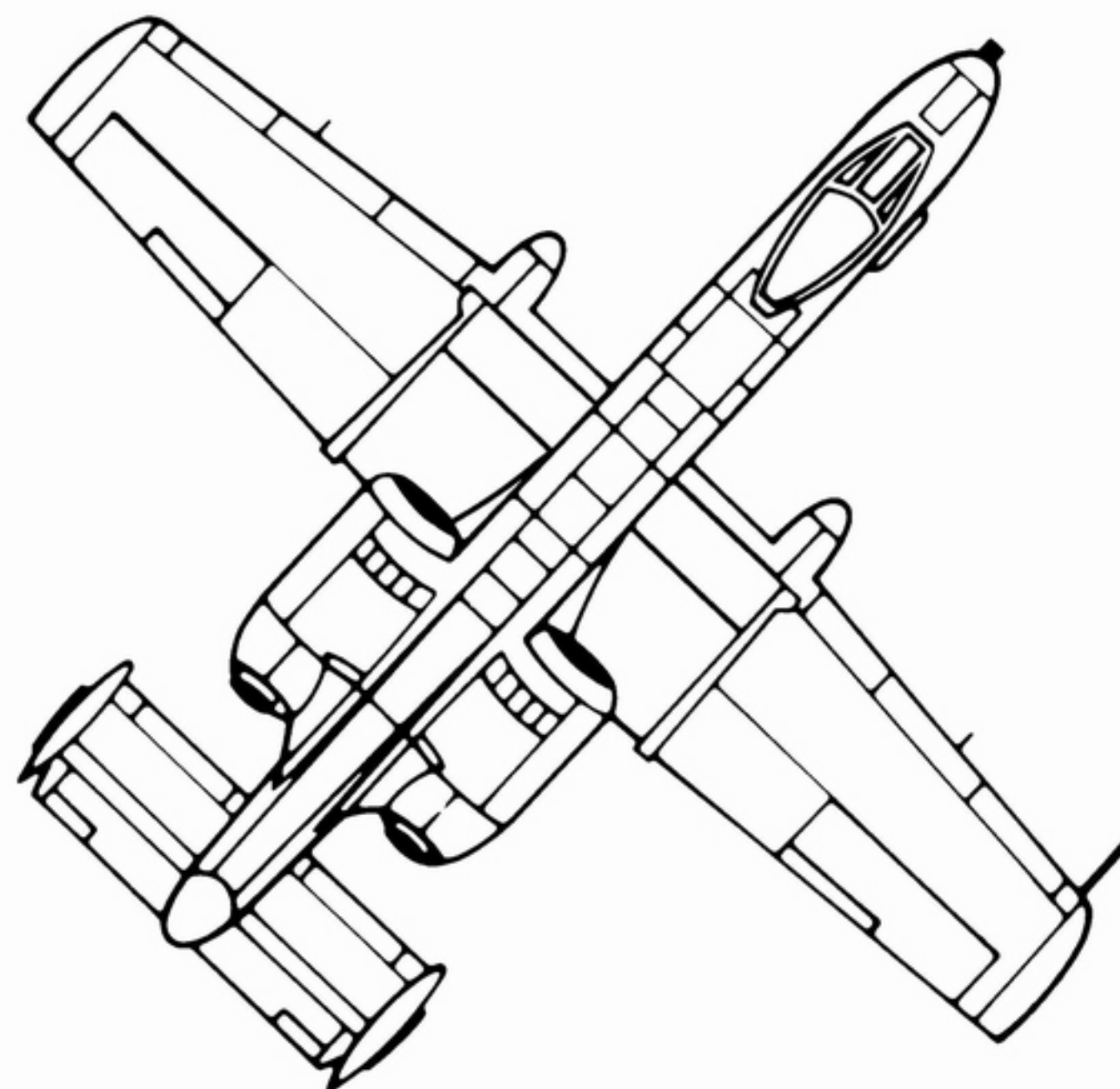
SIMPLICITY: The A-10's structure is conventional with approximately 95 percent of the airframe constructed from aluminum. Single curvature skins are used on all areas aft of the cockpit, permitting ease of maintenance. Redundant load paths used



throughout the aircraft provide airframe reliability and damage tolerance. Numerous aircraft parts are interchangeable left and right, including the engine, main landing gear, and vertical stabilizers.

SURVIVABILITY: The A-10 achieves its survivability through high maneuverability at low altitude combined with electronic countermeasures and chaff/flare dispensers. The pilot and vital elements of the flight control system are protected by a titanium armor "bathtub"; self sealing fuel cells are protected from fire and explosion by the installation of internal and external foam. The A-10's two separated primary flight control systems are further enhanced by a back up manual system permitting the pilot to fly the plane even if all hydraulics are lost.

RELIABILITY: The A-10 has consistently demonstrated its capability for sustained, responsive missions during sortie surge exercises. In a one-day surge effort conducted by the 81st Tactical Fighter Wing at RAF Bentwaters/Woodbridge, U.K., 89 mission capable A-10s accumulated a total of 578.6 hours while flying 533 sorties in a 14-hour period.



DIMENSIONS

Wing Span 57 ft 6 in
Length 53 ft 4 in
Height 14 ft 8 in

WEIGHT

Empty 22,141 lbs
Fuel 10,700 lbs
T.O. Gross 42,500 lbs
(full 30mm ammo; no external ordnance)

PERFORMANCE

Max. Speed S.L. 350 KTS
Cruise at 25,000 290 KTS
Field T.O. Distance 2725 ft.
Service Ceiling 33,500 ft.

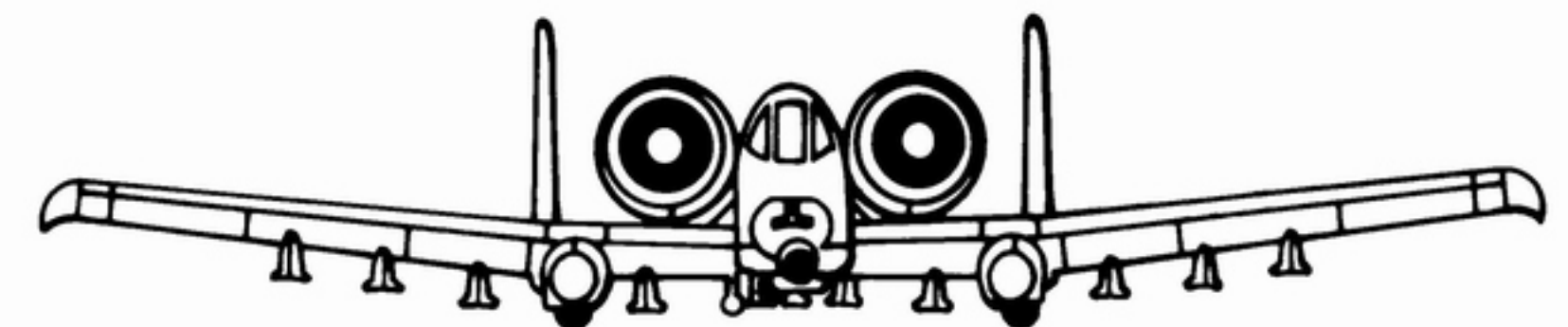
ARMAMENT

One 30mm General Electric GAU-8/A seven barrel Gatling gun.

Ammunition Capacity—1174 rounds
Firing Rate—2100/4200 rounds per minute
Ordnance Capacity—Up to 16,000 pounds of widely varied ordnance on eleven pylon stations including free-fall and precision-guided weapons.

PROPULSION

Two General Electric TF34-GE-100 turbofan engines 9,000 lbs each of thrust.



GRUMMAN®



62/9/20

NORTHROP GRUMMAN

Northrop Grumman Corporation
1111 Stewart Avenue
Bethpage, NY 11714

HIST. CTR. LO2-35

